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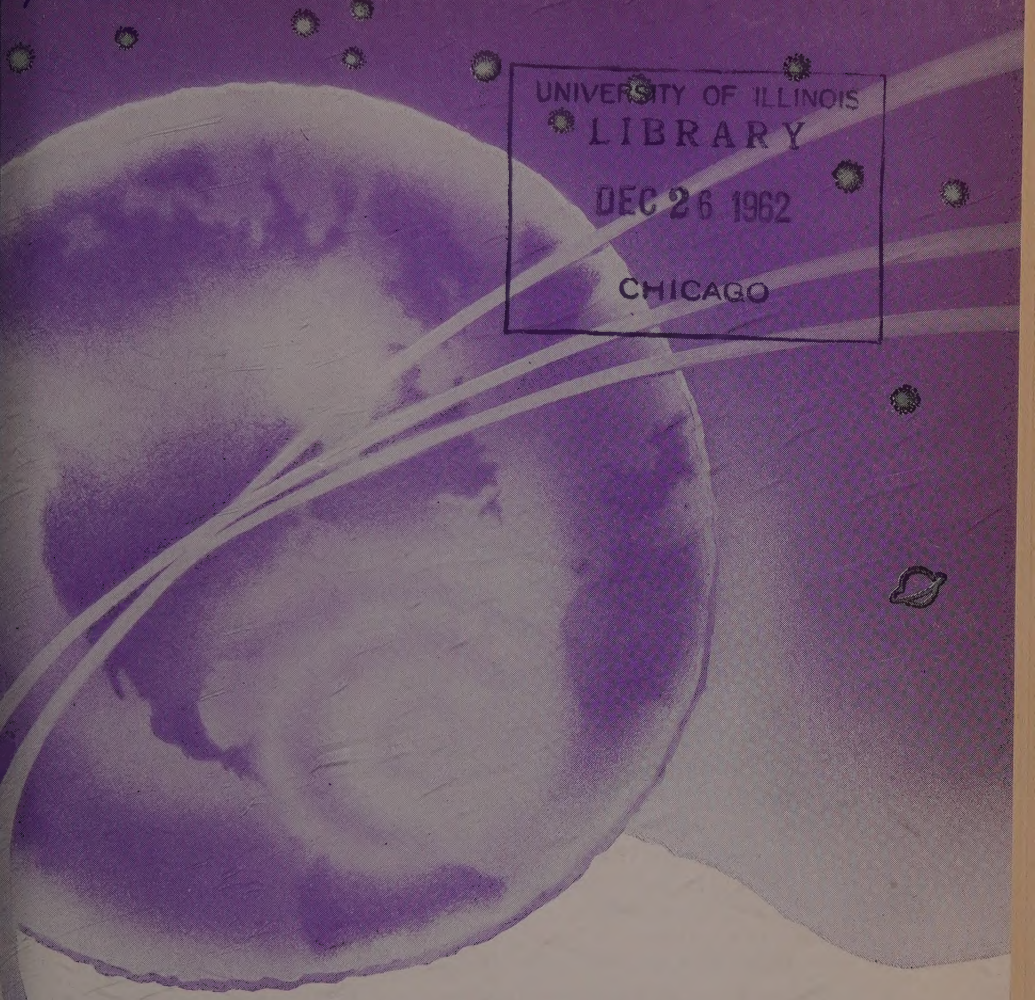

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Supplement on Atmospheric Dynamics and Circulation

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 12 December 1961 No. 12, Part 3
[Pub. Nov. 1962]

DYNAMIC METEOROLOGY, ATMOSPHERIC CIRCULATION AND DISTURBANCES

(A Compilation of Backlog Abstracts for 1950-59)

Compiled by: Muriel F. Haas

Sponsored by
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FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication devoted to current erature in meteorology, geophysics and astrophysics.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a cial subject. Bibliographies published in the successive issues were:

Vol. I, 1950

Atmos. Pollution, 2. Aerobiology, 3. Cloud Physics, 4. Hail, 5. Tornadoes, 6. Volcanic Dust, Climat. Changes, 8. Thunderstorms, 9. Icing, 10. Acoust. Propagation, 11. Evaporation

Vol. II, 1951

Extended Forecast., 2. Long Range Forecast., 3. Soil Temp., 4. Constants, etc., 5. Clim. of Near st, 6. Clim. of Middle East, 7. Special Winds, 8. Radar Storm Detect., 9. Condensation Trails, Clim. of N. E. Africa, 11. Mountain Met.

Vol. III, 1952

Clim. of N. W. Africa, 2. Carbon Dioxide, 3. Clim. of Argentina, etc., 4. Dew, 5. Objective Forecast., Stratus Forecast., 7. Urban Climatology, 8. Clim. of C. Africa, 9. Visibility, 10. Glaze and Rime, Free Air Turbulence

Vol. IV, 1953

Turbulence Theory, 2. Turbulent Diffusion, 3. Frost, 4. Clim. of Australia, etc., 5. High Level nds, 6. Winds in Stratosphere, 7. Jet Stream, 8. Radiation Bioclim., 9. Clim. of Pacific, 10. Auroras, Sferics

Vol. V, 1954

Oceanog. Met., 2. Clim. of S. E. Asia, 3. Auroral Physics, 4. Tropopause, 5. Balloons, 6. Numerical recast., 7. Radiation Data, 8. Vertical Motion, 9. Clim. of Arctic, 10. Industrial Met., 11. Wind ves and Swell

Vol. VI, 1955

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Vol. VII, 1956

Synoptic Met.-Arctic, 2. Clim. of Enclosed Spaces, 3. Cosmic Rays (–1952), 4. Cosmic Rays (1953– , 5. Atmos. Radioactivity, 6. Inversions, 7. Snow Micromet., 8. Snow Micromet. (Suppl.), 1. Tropical Cyclones

Vol. VIII, 1957

Solar Weather Relations, 2. Night Airglow, 3. Forecasting Special Elements, 4. Forest Micro- teorology, 5. Hydromet. Forecasting, 6. Numerical Forecast. (Suppl.), 7. Albedo, 8. Meteors, 0. Tropospheric Prop., 11. Medical Meteorology

Vol. IX, 1958

Radioastronomy, 2. Solar Astrophysics, 3. Radioactivity in Atmosphere, 4. Waves and Currents, Physical Oceanog., 6. Dynamic & Phys. Oceanog., 7. Long Range Forecast., 8. Radar Met., Cosmic Rays, 10–11. Geomagnetism

Vol. X, 1959

Works of C. E. P. Brooks, 2. Tornado Forecasting, 3. Soil Moisture, 4. Sferics, 5–6. Ozone, Acoustic Waves, 8. Evaporation Measurement, 9. Evapotranspiration (–1955), 10. Evapotranspira- n (1956–1959), 11. Evaporation

Vol. XI, 1960

Outstanding Reference Works	2. Outstanding Texts	3. Numerical Forecast. (Suppl.)
Ionospheric Physics	5. Ionospheric Propagation	6. Ionosphere
Forecast Verification	8. Radar Meteorology	9. Rocket Meteorology
Satellite Meteorology	11. Airglow	12. Weather Modification

Vol. XII, 1961

Aurora	4–6. Upper Atmos. Structure	9. Planetary Atmospheres: General
Auroral Physics	7. Precipitation Chemistry	10. Planet. Atmos.: Mars, Venus & Saturn
Limnology	8. Upper Atmos. Humidity	11. Jovian Planets and Moon

Bibliographies in preparation or published in Vol. XIII, 1962

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Geomagnetism (Suppl.)	5. *Energy Exchange Sea-Atmos.*	9. *Waves and Currents*
Cloud Physics and Weather Modification	6. *Ionosphere*	10. *Ionosphere*

Part III contains a listing of translations and the contents of important publications. ese are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where material may be found. The Union List of Serials (Gregory) is the source of most of symbols used. In some cases, where no symbol has been assigned to a library, one will devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DP:	U. S. Patent Office Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by cha

Geographic locations are in the English form rather than the form used locally, for exam Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless other stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modi tion of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Nun (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thu entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau, Jahrgang* 2 (2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

)YNAMIC METEOROLOGY, ATMOSPHERIC CIRCULATION AND ATMOSPHERIC DISTURBANCES

(A Compilation of Backlog Abstracts for 1950–59)

Compiled by: Muriel F. Haas

INTRODUCTION

This third supplement completes Vol. XII of *Meteorological and Geoastrophysical Abstracts.* in the case of Supplement No. 1, **Forecasting and Synoptic Meteorology**, published in Aug. 62, and Supplement No. 2, **Oceanography**, published in Sept. 1962, this supplement is composed unpublished abstracts of articles originally appearing in sources published during 1950–59. ese supplements are indexed in the annual indexes for Vol. XII (1961).

The arrangement is according to the Universal Decimal Classification (U.D.C.) System for teorology:

551.511 **Mechanics and thermodynamics of the atmosphere in general**
551.513 **General circulation of the atmosphere**
551.515 **Weather, atmospheric formations and disturbances**

The following systematic subject outline shows in detail the arrangement of material included ein. The U. D. C. numbers corresponding to each heading are given as an aid to the user who hes to locate analogous material in the regular issues of *Meteorological Abstracts and Bibliography* (Vol. I–X) or in current or future issues of *Meteorological and Geoastrophysical Abstracts.*

The present and previous special issues of blacklog material, together with the Decennial lexes for 1950–59 are being compiled and published with the aid of funds provided by the tional Science Foundation for this specific purpose. Most of the original abstracting was ie under contract with the Air Force Cambridge Research Center during 1949–1959.

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PART A. DYNAMIC METEOROLOGY (551.511)

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE IN GENERAL (551.511)

12N–1 551

Massachusetts Institute of Technology, **Meridional eddy flux of energy in the North Hemisphere.** Contract AF19-122-153 (General Circulation), Report No. 3, May 31, **1950.** p. tables, refs., eqs. **DWB**—The meridional energy flux is calculated by means of finite di ence integration methods from Northern Hemisphere charts for the winter of 1945–46 and f actual rawin and radiosonde data over regions of North America for Feb. and Aug. 1949. characteristics of the transport of enthalpy and of latent energy at different latitudes, in troposphere and stratosphere and during the different seasons are discussed. *Subject Headi* **1. Eddy diffusion 2. Energy transfer 3. Northern Hemisphere. I. White, Robert M.**—*I.*

12N–2 551.511:551

California. University at Los Angeles. Dept. of Engineering, **An experimental invest tion of heat and momentum transfer at a smooth air-Earth interface.** Contract N6-ONR- T.O. VI, Contract NR-082-036, [Report], May **1951.** 53 p. photos, graphs, diagrs., refs., **DWB**—A continuation of the work mentioned in abstract of a paper by Poppendiek and Vehr camp, May 1950 (*see* 4B–237, Feb. 1953, *MAB*), citing micrometeorological observations the bed of a smooth dry lake. The chief conclusions, based on instrumental measurements w are summarized and presented in this paper, are that vertical convective heat transfer rates ca determined by measurements made with a net exchange radiometer and a heat meter. Boun shear stresses over a smooth natural surface indicate a transition from smooth to fully devel rough flow with increasing velocities. Free convection plays a great part in the convection tr fer in unstable atmosphere. Need of better instrumentation is stressed. *Subject Headi* **1. Eddy diffusion 2. Drag coefficients 3. Micrometeorology 4. El Mirage Dry Lake, C I. Poppendiek, H. F. II. Vehrencamp, John E.**—*M. R.*

12N–3 551.511:551.5

Kuo, Hsiao-Lan (*M.I.T.*), **Three dimensional disturbances in a baroclinic zonal curr** Massachusetts Institute of Technology. General Circulation Project, Contract AF 19-122- Scientific Report No. 1, Dec. 31, **1951.** 39 p. 10 figs., 2 tables, refs., eqs. **DWB**—A ma matical model of three-dimensional large scale disturbances is derived by applying a s Lagrangian coordinate system according to Starr. The structure of these theoretically calcul disturbances seems to be similar to that of the atmosphere. They produce a downward trans of zonal momentum and a northward transport of heat of the same order of magnitude as actually observed. The author presents the results of his investigations in instructive fig giving the eigenvalues, phase velocities, the amplifying factor of unstable disturbances and distribution of vertical velocity, temperature and horizontal mass divergence for a zonal sec

e numerical solution of the equation thus obtained, is rather laborious. *Subject Headings:* **Baroclinic disturbances 2. Eddy flux 3. Atmospheric circulation. I. Starr, Victor P.**—*Assur.*

12N–4 551.511:533.6

Tchen, Chan-Mou (*U. S. Nat. Bur. Standards*), **Heat delivery in a compressible flow and plications to hot-wire anemometry.** *U. S. NACA, Technical Note* No. 2436, Aug. 1951. p. diagrs. **DWB**—In a two dimensional field a generalized potential theory applicable to termining the three variables which are: distribution of additional temperature ϑ, velocity per- nadiabatic and rotational flow is developed. Three partial differential equations are first obtained rbation ϕ, and an auxiliary function k characterizing the rotationality of the flow. With the e of this theory the action of heat sources of the flow is studied, and the heat delivery in a mpressible flow at subsonic and supersonic speeds is calculated. *Subject Headings:* **1. Aero- namics 2. Hot wire anemometry.**—*Author's abstract.*

12N–5 551.511:551.513.2

Rossby, Carl Gustaf, **On the nature of the general circulation of the lower atmosphere.** n: Kuiper, G. P. (*ed.*), **The atmospheres of the Earth and planets.** Rev. ed. Chicago, Univ. Chicago Press, 1952. p. 16–48, 24 figs., 27 refs.) **DWB**—The thermodynamics and hydro- namics of trade wind cells are in need of reexamination. The strongest solenoid concentration served anywhere in a vertical meridional plane is the result of a mechanical rather than a ermal process. The kinetic energy of quasihorizontal disturbances located anywhere in the nosphere must be dispersed rapidly around the earth along the latitude circles. Any quasi- rizontal circulation set up through the release of the potential energy supply of any unstable rangement of air masses of different density would be dispersed around the globe, and the netic energy obtained from many sources of this type would ultimately accumulate in one or veral jet stream zones. During periods of jet stream intensification there must occur a transport angular momentum from highest to lower latitudes. *Subject Headings:* **1. Trade wind cell namics 2. Tropospheric circulation.**—*E.Z.S.*

12N–6 551.511:551.513.1

†Stickles, Albert Louis, II, **Dynamics of long waves in a barotropic westerly current with three-dimensional velocity perturbation.** Thesis (M.Sc.)—United States Naval Postgraduate hool, Monterey, Calif., 1952. 38 p. 3 figs., table, 36 refs., 61 eqs. **DWB** (M15 S854d)— is paper presents the results of a study of imposing a three dimensional perturbation on a rotropic westerly current. The purpose of the present investigation was to present theoretical lutions to the following basic problems: (1) the determination of the three dimensional structure the wave, (2) the determination of the speed of propagation of the wave and (3) the value of nsidering vertical motion in the wave motion. *Subject Headings:* **1. Dynamic meteorology. Long wave analysis.**—*Author's abstract.*

12N–7 551.511:532.5

Eliassen, A.; Høiland, E. and Riis, E., **Two-dimensional perturbation of a flow with con- nt shear of a stratified fluid.** *Norske Videnskaps-Akademi i Oslo. Institutt for Vaer- og imaforskning, Publication,* No. 1, 1953. 30 p. fig., 5 refs., numerous eqs.—A flow between o rigid planes of an incompressible, inviscid, stratified fluid with constant shear is considered. troducing a perturbation equation with Richardson's number (τ) as the only constant, eigen- utions are obtained for stable cases ($\tau > \frac{1}{4}$), weak stability or instability ($\tau < \frac{1}{4}$). Singular utions are derived for $-2 < \tau < \frac{1}{4}$ as well as an integral solution for $\tau < -2$. *Subject Head- ıs:* **1. Hydrodynamics 2. Perturbation equations.**—*A. Assur.*

12N–8 551.511:532.5

Høiland, Einar, **On the dynamic effect of variation in density on two-dimensional per- rbations of flow with constant shear.** *Geofysiske Publikasjoner,* Oslo, 18(10), 1953. 12 p. s. Shorter version issued as: *Norske Videnskaps-Akademi i Oslo. Institutt for Vaer-og imaforskning, Report* No. 2, 1952. 3 p. foot-ref., 13 eqs. **DWB** (M055 N863p)—A rec- near, horizontal current is assumed with the velocity proportional to the height and the density ven by an exponential function of the height. Both static stability and instability can be nsidered. Solutions of the perturbation equation are analyzed for a layer bounded by two planes, well as for the case when the upper boundary is a free surface. *Subject Headings:* **1. Per- rbation equations 2. Hydrodynamics.**—*A. Assur.*

12N–9 551.511:53

Høiland, Einar, **On two-dimensional perturbation of linear flow.** *Geofysiske Publikasjo* Oslo, 18(9), **1953.** 12 p. 5 figs., 3 refs., eqs.—Theoretical study of the stability of waves in incompressible and homogeneous fluid flowing between two parallel horizontal rigid surfaces. instability of the system depends mainly on the shape of the vertical velocity profile which assumed as a cosine function with a point of inflection. The flow is stable if the height of layer is less than half the profile wave length. A similar result can be obtained if the Cori force is taken into account. *Subject Headings:* **1. Hydrodynamics 2. Instability 3. Pertur tion waves.**—*A. Assur.*

12N–10 551.511:551.551:

†Kuethe, Arnold M. (*Mich. Univ.*), **Review of transport processes in turbulent shear flo** *Midwestern Conference on Fluid Mechanics, 3rd, Univ. of Minnesota, March 1953* [*Proceedin* pub. June **1953.** p. 85–101. bibliog. p. 96–101. **DWB, DLC** (QA901.M153)—Transport p nomena in boundary layers, wakes, jets, centrifugal and gravity fields are examined in light theory and of empirical data. Horseshoe vortices are thought to be found in tornado systems in larger cyclones. Ring vortices and diffusive character of turbulent fields are also discuss Turbulence in shear flow, vortex streets, formation of "spots" in wake when changing from lami to turbulent flow, Poiseuille flow, transfer parameters, heat transfer in force fields and ot aspects of growth and decay of eddy fields are reviewed. Bibliography is extensive and is cla fied into main subject headings discussed in text. *Subject Headings:* **1. Turbulent transp processes 2. Turbulence bibliographies.**—*M.R.*

12N–11 532.5:551.

Parker, Eugene N. (*Dept. of Math. & Astr., Univ. of Utah, Salt Lake City, Utah*), **Ext sion of Heisenberg's model of turbulence to critical Reynolds numbers.** *Physical Revi* N. Y., 90(2):221–223, April 15, **1953.** foot-refs., 27 eqs. **DWB**—By considering a few ex physical complications introduced by the presence of boundaries, small velocities, etc., it is poss to extend Heisenberg's methods to the calculation of critical Reynolds numbers. Calculations carried out for Couette, plane Poiseuille, and Blasius flow. The results are found to be wit about 20% of the observed values. *Subject Headings:* **1. Reynolds numbers 2. Turbule theories.**—*Author's abstract.*

12N–12 551.511:551.521.3:551.52

*Fukui, Eiichiro, **Meridional distribution of radiant energy: its climatological and g graphical significance.** *Tokyo. Univ. of Education, Geographical Institute, Science Repo* 3(16):1–22, March 20, **1954.** 10 figs., 2 tables, 12 refs., 6 eqs.—The meridional distribution thermal energy over the Earth's surface is theoretically examined. First, the problem of ins tion over the Earth's surface, assuming the Earth had no atmosphere, is considered. Next same problem is examined taking the Earth's actual conditions into consideration. Further, i shown that the effective atmosphere consists of, in fact, the incoming radiation subtracted f the outgoing. Finally, the climatological and geographical significance of meridional distribut of radiant energy is considered. *Subject Heading:* **1. Radiant energy distribution.**—*I.S.*

12N–13 551.515.11:551.5

Raethjen, Paul, **Frontalzyklogenesis.** [Frontal cyclogenesis.] *Geophysikalische Ein schriften* (Issued by Geophysikalische Institut, Hamburg Univ.), Hamburg, No. 2, **1954.** p. 94. figs., 31–35, eqs. 115–126. "This is revision of Ch. 7, **Frontalzyklogenesis,** of his **Kon tution der Atmosphäre (Kurzer Abriss der Meteorologie dynamisch gesehen, Vol. 1),** iss **1947."** (For abstract *see* 7–29, July 1950, *Met. Abs.*) **DLC** (QC861.R3)—Special referenc made to eddy formation and maintenance of geostrophic equilibrium. A vertical section throug European frontal zone is shown. Three sections show the development of a high, a low an vertical section. The vorticity equation is worked through and equations for various cycl types are explained. *Subject Headings:* **1. Frontocyclogenesis 2. Cyclogenesis.**—*E.Z.S.*

12N–14 551.511:551.557:551.5

Lorenz, Edward N., **Note on the geostrophic measurement of angular momentum f** (In: Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(122)- Studies of the Atmospheric General Circulation, Final Report, Pt. 1, May 31, 1954. p. 98– 3 refs., 9 eqs.)—Analyzes the problem of how the deviations of the actual from the geostro wind change the computed angular momentum flow. There should be a difference when the su imposed eddy motion is not horizontally uniform as well as a systematic difference due to spherical shape of the earth. The magnitude of some of these effects might be very small. *ject Headings:* **1. Angular momentum 2. Geostrophic approximation.**—*A. Assur.*

12N–15 551.511:551.513.1

Lorenz, Edward N., **Available potential energy in the atmosphere.** (In: Massachusetts titute of Technology. Dept. of Meteorology, Contract AF 19(122)–153, Studies of the Atmos- ric General Circulation, Final Report, Pt. 1, May 31, **1954.** p. 174–185. 5 refs., 11 eqs.)— e atmosphere has a high potential energy but less than 1% is generally available for conversion kinetic energy. The ratio between actual kinetic energy and available potential energy is ut 1 : 10. Relations between zonal and eddy energy are discussed. *Subject Headings:* **1. ential energy 2. Kinetic energy 3. Circulation statistics.**—*A. Assur.*

12N–16 551.511:551.513:532.5

Lorenz, Edward N., **Proposed explanation for the existence of two regimes of flow in a ating symmetrically-heated cylindrical vessel.** (In: Massachusetts Institute of Technology. pt. of Meteorology, Contract AF 19(122)-153, Studies of the Atmospheric General Circulation, al Report, Pt. 1, May 31, **1954.** p. 505–521. 12 refs, eqs.)—A physical explanation is pro- ed to account for the existence of at least 2 distinct regimes of flow of a fluid in a rotating mmetrically-heated cylindrical vessel. According to this explanation, there exists a mathe- ically possible symmetric flow, characterized by a quasi-gradient zonal circulation and a weak idional circulation. Such a flow may be observed experimentally if it is dynamically stable, not if it is unstable. The stability of such a baroclinic flow depends partly upon a stability nber, which varies inversely as the static stability and directly as the square of the rate of

ation. The static stability is controlled partly by the meridional circulation, which carries warm d through the upper layers and cool fluid through the lower layers. The strength of the idional circulation depends upon the strength of the heating and the rate of rotation. Thus iciently weak and hence an unstable symmetric flow, symmetry is not observed experimentally. *ject Headings:* **1. Atmospheric circulation theories 2. Meridional circulation 3. Fluid ws.**—*Author's abstract.*

12N–17 551.511:532

Garmendia Iraundegui, José, **Sobre el método del fluído associado a un corpúsculo.** [Cor- cular fluid motion.] *Revista de Geofísica, Madrid,* 14(53):31–33, Jan./March **1955.** 2 refs., qs. **DWB, DLC**—Theoretical discussion of properties of fluid in irrotational motion follow- the ideas of Mme F. Aeschlimann, (*Journal de Physique et de Radium,* 15:752, **1954.**) *Sub- Headings:* **1. Irrotational fluid motion 2. Corpuscular fluid motion.**—*M.R.*

12N–18 551.511:536.25

Kuo, Hsiao-Lan (*Mass. Inst. of Tech.*), **On convective instability of a rotating fluid with a izontal temperature contrast.** *Journal of Marine Research,* New Haven, Conn., 14(1):14– **1955.** 3 figs., 4 tables, 11 refs., 36 eqs. **DWB, DLC.** Also issued in: Massachusetts Insti- of Technology. Dept. of Meteorology, Contract AF 19(122)-153, **Studies of the atmospheric eral circulation,** Final Report, Pt. 1, May 31, **1954.** p. 479–504. 3 figs., 10 refs., 4 tables, eqs. **DWB**—A simple expression of the criterion for the onset of symmetrical thermal con- tion of a rotating fluid subject to a horizontal temperature contrast is obtained. It is shown both the rotation and a positive static stabiliy act to inhibit the convection. The extent of se inhibitions depends upon the nondimensional parameters

$$T = 4\Omega^2 d^4 \nu^{-2}, \text{ and } R = g d^4 k^{-1} \nu^{-1} \alpha d\theta_0/dz,$$

ere d denotes the depth of the layer, Ω the rotation rate, α the thermal expansion coefficient, ne thermometric conductivity, ν the kinematic viscosity and $d\theta_0/dz =$ the vertical temperature dient. For given values of T and R, the onset of convection requires the nondimensional ameter $Q = gd^4k^{-1}\nu^{-1}\alpha d\theta_0/dr$ to be higher than a critical value Q_c, and furthermore there is a t favorable cell size l_c for which the required value of Q is lowest. Q_c generally increases T and also increases with l for l larger than l_c. When T is very large, the parameter $K_c = dQ_c(lT)^{-1}$, which is the product of a Rossby number and the Prandtl number νk, approaches onstant, suggesting that the onset of such convection in the atmosphere and in the ocean may determined by this product. In order to examine the possible difference of conditions in tems such as the atmosphere and the ocean on the one hand and that in model experiments the other, two cases are discussed: (a) when the hozizontal extent a of the fluid is infinitely e compared with its depths d, and (b) when $a = d$. *Subject Headings:* **1. Convection theories nstability criteria.**—*Author's abstract.*

12N–19 551.511:551.513.1:517

Onishi, Gaishi (*Tôhoku Univ., Geophys. Inst.*), **Dynamical influence of the convection on atmospheric disturbance.** *Tôhoku Univ. Science Reports, 5th Ser., Geophysics,* 7(2):61–72, . **1955.** 5 figs., 6 refs., 23 eqs. **DWB, DLC**—The influence of convection on atmospheric

disturbances is developed in a first order perturbation theory, by using the variational method. is found, when friction is neglected, convection has only a slight influence on long waves considerable influence on short waves. If the convection is stronger than a critical value, tremely short waves become unstable even under the zero wind shear. This effect is remark in the lower latitude, espcially in the vicinity of the equator. *Subject Headings:* **1. Convec 2. Perturbation thories.**—*Author's abstract.*

12N–20 551.511:551.551:53

§†Weinstein, Alvin S., **Diffusion of momentum from free and confined slot jets into mov secondary streams.** Carnegie Institute of Technology. Dept. of Mechanical Engineering. C tract AF 18(600)-969, Scientific Report, No. 2, May 4, **1955.** 149 p. 81 figs. and charts tables, 22 refs., 38 eqs.—Results are presented for an experimental impact tube study of diffusion of momentum for isothermal, incompressible turbulent mixing of a slot jet issuing a slower moving secondary stream with various boundary conditions. The symmetric spread a jet issuing from a slot into a uniformly flowing secondary stream of low initial turbule termed the "free slot jet," is well correlated by phenomenological expressions based on assumpt suggested by the Engineering Experimental Station of the Univ. of Illinois and extended in report to include the case of the jet issuing into a moving secondary. The single parameter u which this correlation is based, the spreading coefficient, is shown to have an interesting interpr tion in terms of particle diffusion into uniformly flowing fields of homogeneous isotropic turbule The asymmetric jet, bounded on one side by a plate parallel and adjacent to the fluid discharg from the jet and allowed to mix freely with a moving secondary stream on the other side, ter the "confined slot jet," is also correlated, but by empirical techniques based upon the express developed for the free slot jet. The flow pattern for this problem is discussed and it is sh by using a particle-stream model how changes in turbulent intensity affect the flow pattern. V behaved changes in momentum flux are shown to exist for both of these problems along with a variations in the static pressure. *Subject Headings:* **1. Turbulent jets 2. Turbulent tran of momentum.**—*Author's abstract.*

12N–21 551.511:551.52

Gandin, L. S. and Soloveĭchik, R. E., **O periodicheskom khode temperatury pri nali advektsii.** [Periodic temperature variation in the presence of advection.] *Leningrad. Glav Geofizicheskaia Observatoriia, Trudy,* No. 60(122):23–31, **1956.** 2 figs., 26 eqs. **DWB**—In existing theories of daily temperature variations, advection, i.e., horizontal motion of air mas is not being taken into consideration. As a result of this, in practical computation, the advec changes of temperature are included independently of daily variations. However, it is evi that advection significantly affects the character of daily temperature variations. The pre article considers this influence. The mathematical bases of the problem are given and the solu is shown, followed by an analysis. *Subject Headings:* **1. Diurnal temperature variations Advection-temperature variation relationships.**—*B.J.G.*

12N–22 551.511:551.573:634.9:551.509.58:551.

Hannaford, Jack F., **Multiple-graphical correlation for water supply forecasting.** West Snow Conference, 1956, **Proceedings,** 24:26–32, Oct. **1956.** 5 figs. **DWB** (M06 W527p)— illustration of the thermodynamic relationships involved in forest transpiration during nonad tive weather is presented. A detailed energy balance is worked out for WBSL with data f the nonadvective period in the 1949 spring melt season. The illustration shows that if inci radient energy is known, transpiration energy may be evaluated as a residual difference betw input energy and the melt energy equivalent of measured runoff from the basin. *Subject H ings:* **1. Water supply forecasting techniques 2. Transpiration of forests.**—*I. S.*

12N–23 551.511:551.551.2(

Laĭkhtman, D. L. and Orlenko, G. P., **Ob intensivnosti turbulentnogo obmena nad vod poverkhnost'iu.** [Turbulent exchange intensities above water surfaces.] *Leningrad. Glav Geofizicheskaia Observatoriia, Trudy,* No. 60(122):51–52, **1956.** fig., 2 eqs. **DWB**—This b article investigates the problem of the determination of the characteristics and magnitude of bulent processes over water. Based on the data of experimental observations, the author descr the derivation of formulas which define the magnitude or intensity of various processes occur in the atmosphere over water. *Subject Headings:* **1. Turbulent exchange calculation te niques 2. Turbulence over water.**—*B.J.G.*

12N–24 551.511:551.557:551.5

Miyakoda, K. (*Geophysical Institute, Tokyo Univ.*), **On a method of solving the bala equation.** *Meteorological Society of Japan, Tokyo, Journal,* Ser. 2, 34(6):364–367, Dec. 19

igs., 10 refs., 15 eqs. **DWB, DLC**—The primary purpose was an attempt to make use of the ergence equation in order to obtain a closer approximation of the wind than the geostrophic proximation. This method is compared with those previously presented, such as linearization the balance equation and the role of the nongeostrophic component in the variation of energy the atmosphere. The author devised another method in which the nonlinear term is partly nsformed into linear form by solving the balance equation analytically. *Subject Heading:* Balance equation.—*Author's abstract.*

12N–25 532.72:551.511

Palm, Enok, **On diffusion of a cluster.** *Norske Videnskaps-Akademi i Oslo. Institutt for er-og Klimaforskning, Report,* No. 2, 1956/1957. 8 p. 3 refs., 28 eqs. **DWB** (M(055) 663p)—A theoretical paper based mainly on RICHARDSON's work on atmospheric turbulent fusion in general (1926) and on the eddy diffusion of clusters (1952). *Subject Heading:* **1. ffusion theories.**—*G.T.*

12N–26 551.511

Čadež, M., **O stablnosti atmosfere.** [Stability of the atmosphere.] *Društvo Meteorologov venije, Meteorološki Zbornik,* 1:5–13, **1957.** 7 refs.. 37 eqs. English summary p. 13. **DWB, C**—The differential equation for specific humidity and an exact formula expressing the satura-n-adiabatic lapse rate are developed, using the Clausius-Clapeyron equation. It is shown that urated atmosphere is in stable, unstable or indifferent state if the vertical temperature lapse e is lower, higher or equal to the pseudoadiabatic lapse rate. In the nonsaturated atmosphere analogical criterion is available only more or less approximately. *Subject Heading:* **1. Vertical nperature gradient.**—*Author's abstract.*

12N–27 551.511:551.579

Dubinskiĭ, G. P., **K voprosu ob izuchenii teplovogo i vodnogo rezhima zemnoĭ poverk-osti.** [Question of the study of thermal and water regime of the Earth's surface.] *Akademiia uk SSSR, Izvestiia, Ser. Geog.,* No. 2:84–96, **1957. DWB**—Discussion of the subject of use heat and water balance calculations in physical geography, plant microclimate, irrigation, climatic ssification, etc., based on work of I. P. GERASIMOV (1956). *Subject Headings:* **1. Heat bal-ce of Earth's surface 2. Hydrologic balance calculations.**—*M.R.*

12N–28 551.511:551.511.33:551.543

Haurwitz, B., **Horizontal advection and the motion of pressure and flow patterns.** New rk. Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanog-hy, Contract AF 19(604)-1738, Scientific Report No. 5, Oct. **1957.** 34 p. 5 figs., 2 tables, efs., eqs. **DWB**—A relation is derived between pressure variations at different levels in the iosphere under a number of simplifying assumptions. Essentially, the atmospheric model under sideration allows for pressure changes only by means of density advection and by means of an er pressure disturbance which is given a priori. It is shown that this advective model gives sonable values for the speed of tropospheric pressure disturbances, despite its crudeness. Some mples are presented which show how a given upper wave should be transmitted downward. der certain conditions, namely when the speed of the upper wave is the same as the speed of free oscillations of the advective model, a resonance magnification of the upper wave could e place in the lower layer. The numerical parameters of the examples are chosen so that might conceivably apply to a hypothetical upper disturbance induced by solar activity, although mechanism is suggested for the excitation of the upper disturbance by the sun. It is con-led that even if such an upper disturbance due to solar effects existed, it is unlikely that it could e itself felt at low levels in the atmosphere because it does not appear possible that it could substantially magnified by the advective model while transmitted downward. *Subject Headings:* Pressure variations **2. Horizontal advection 3. Upper flow patterns.**—*Author's abstract*

12N–29 551.511:551.43

Magata, M. (*Meteorological Research Institute*), **On the topographical effect upon the turbations of the middle latitude westerlies.** *Papers in Meteorology and Geophysics,* Tokyo,):25–38, April **1957.** 8 figs., 5 refs., 43 eqs. **DWB**—In order to discuss the general char-r of the perturbations of the westerlies produced by mountains such as the Himalayas and the kies, the stationary vorticity equation for the equivalent barotropic level is solved, taking into unt topographical factors. It is shown that owing to the intensity of the general current, e are critical cases in which a single jet stream, or two branches of it, appear and these can egarded as characterizing the normal state at the 500 mb level in Jan. or June respectively. particular, persistence of a ridge over the Sea of Okhotsk in the Bai-u season, is thought to be

produced in connection with the Himalayas. The effect of shear of the general current friction upon the flow pattern are also discussed. *Subject Headings:* **1. Vorticity equati including orographic effects 2. Orographic effects on westerlies.**—*Author's abstract.*

12N–30 551.511:551.

Uspenskiĭ, B. D., **K voprosu ob ispol'zovanii nabliudeniĭ nad vetrom pri analize dinami kinematiki atmosfernykh protsessov.** [The use of wind observations in the analysis of the dynan and kinetics of atmospheric processes.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy,* 60:44–50, **1957.** 3 figs., 4 refs., 11 eqs. **DWB** (M(055) U581tts)—The equation of vortical velo for an atmospheric layer bounded by isobaric surfaces p_1 and p_2 ($p_1 < p < p_2$) is

$$\frac{\partial H}{\partial t} = \frac{1}{lm}(H_1 \Delta H) + \frac{1}{m}(H,l) + \frac{(l^2+\Delta H)}{m}\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right) + \frac{kln\,\frac{p_2}{p_1}}{m(p_1-p_2)}\left(\frac{\partial T}{\partial x}\frac{\partial w_p}{\partial x} + \frac{\partial T}{\partial y}\frac{\partial w_p}{\partial y}\right),$$

where x, y, p =spatial coordinates; t =time; H =geopotential height of isobaric surface l =Coriolis parameter; u, v =component horizontal velocities; w_p =vertical velocity of relative isob surface p; T =gas constant; $\Delta = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}$ =Laplacian operator; expression of the form $(A,$ =Goeobian; m =coefficient of proportionality in the equation $\Delta \frac{\partial H}{\partial t} = -m \frac{\partial H}{\partial t}$. For forecast local variations of elevations $\Delta T_{700-500}$ the formula

$$\frac{\partial H}{\partial t} = \frac{1}{lm}(H,\Delta H) + \frac{l^2}{m}\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)$$

is used. The approximate determination of the divergence factor can be obtained from the t perature field. If the latter corresponds to the lower stratospheric layer then the above equat becomes

$$\frac{\partial H}{\partial t} = a(H_1 \Delta H) + b\left(u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y}\right)_{p=200},$$

where

$$a = \frac{(\gamma_a - \gamma)(p_0 - p)}{l[m(\gamma_a - \gamma)(p_0 - p) + l^2 g^2 \rho n]}$$

and

$$b = \frac{lg^2\rho}{[m(\gamma_a - \gamma)(p_0 - p) + lg^2\rho n]}.$$

In the latter formulas, g =acceleration of gravity, γa =adiabatic gradient of temperature, n =coefficient in the equation

$$\frac{\partial T_{p=200}}{\partial t} = -n\frac{\partial H}{\partial t} + k.$$

The formula for determining the divergence factor from the temperature fields of the 700 and 850 surfaces is derived to be

$$\frac{\partial H}{\partial t} = \frac{4g\rho_7}{\gamma_7(p_{10}-p_7)}\frac{l^2}{m}\left(u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y}\right)_7 - \frac{3g\rho_8}{\gamma'_8(p_{10}-p_8)}\frac{l^2}{m}\left(u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y}\right)_8.$$

The equations for local acceleration are:

$$\frac{\partial u}{\partial t} = -l\left(\frac{1}{l}\frac{\partial H}{\partial x} + v\right), \qquad \frac{\partial v}{\partial t} = l\left(-\frac{1}{l}\frac{\partial H}{\partial y} - u\right).$$

Subject Headings: **1. Vertical wind velocities 2. Dynamics of the atmosphere 3. Kinetic ene** —*I.L.D.*

12N–31 551.511:551.551:5

Chanda, Benoyendra, **Turbulent boundary layer over heated and unheated, plane, ro surfaces.** Colorado. State Univ. Dept. of Civil Engineering, Contract AF 19(604)-1706, entific Report, No. 1, May **1958.** 132 p. 44 figs., 3 tables, 24 refs., 89 eqs. **DWB** (M C719sc)—Crushed stone 0.25–0.315 in. glued to open mesh fiberglass cloth and laid on the f of the wind tunnel formed the rough surface. Two air speeds, $U_o = 17$ fps and 35 fps and temperature difference for each velocity were used. The temperature differences were approxima 75°F and 48°F for $U_o = 17$ fps and 35 fps respectively. The heated surface was 10 ft

inning 43 in. downstream from the leading edge of the rough surface. Constant temperature
e hot wire anemometers and a resistance thermometer were used to obtain the experimental
a. Considering density as a function of temperature, the displacement thickness δ^*, momentum
kness δ^{**} for the momentum boundary layer and the convective thickness $\delta_T{}^{**}$ for the thermal
ndary layer, were used in forms similar to those used in the case of compressible fluids. The
ematic viscosity of air corresponding to the wall temperature (T_w) rather than free stream
perature (T_o) was used as a reference viscosity. Using an analysis similar to that presented
Townsend, Clauser, and Hama it is found that the velocity-defect law is universal for smooth,
gh, heated and unheated surfaces. Vertical distributions of the intensity of velocity fluctuations
well as the intensity of temperature fluctuations are also presented. *Subject Heading:* **1.**
rbulent boundary layer.—*From author's abstract.*

12N–32 551.511:551.551.8:551.526.6:551.524.4

Kolesnikov, A. G. and Pivovarov, A. A., **O sootnoshenii mezhdu koeffitsientami turbulent-
ti i teploobmena v privodnom sloe atmosfery.** [Relation between the coefficients of turbulence
heat exchange in the air layer near the water.] *Akademiia Nauk SSSR. Morskoĭ Gidrofizi-
skiĭ Institut, Trudy,* 13:65–72, **1958.** 6 refs., 33 eqs. **DLC, DWB** (M(055) A313tr)—The
iors' attempt to determine the equivalence of two methods of determining turbulent heat ex-
nge in the ground layer of the atmosphere, under the condition that the air temperature at
ght h, is given. In the one method, the temperature of sea water is computed by using an
ression for turbulent heat exchange in the form of the derivative of temperature with respect
he coefficient of heat exchange; in the other, turbulent heat exchange is written in the form of
derivative of the coefficient of turbulent exchange with respect to the temperature gradient.
solution of the problem of the formation of 24-hr variations of sea temperatures deviating
n the mean 24-hr value, under the influence of the 24-hr variation of total radiation derivations,
ctive radiation evaporation or condensation, and variation of air temperature by the two methods
presented, and the respective equations for temperature deviations are given. The solutions
ained with these equations are compared and it is shown that in the case of a quasistationary
flow in the layer of the atmosphere near the water, both methods for determining heat flux
almost identical results. The computation of the coefficient of turbulent heat exchange is
strated. *Subject Headings:* **1. Heat flux calculation techniques 2. Turbulent heat ex-
nge calculation techniques.**—*I.L.D.*

12N–33 551.511:551.521:551.584.34(98)

Laĭkhtman, D. L., **Zakonomernosti fizicheskikh protsessov pogranichnogo sloia atmosfery
rktike.** [Characteristics of physical processes in the boundary layer of the atmosphere in the
tic.] (In: Leningrad. Glavnaia Geoficheskaia Observatoriia, **Sovremennye problemy me-
rologii prizemnogo sloia vozdukha.** Leningrad, **1958.** p. 26–42. 17 figs., 4 tables, 35 eqs.)
C (QC982.7.L4) Transl. into English by George S. Mitchell and Irene A. Donehoo. Wash.,
C. U. S. Weather Bureau, July **1959. DWB** (M10.522 U581soE)—The study of the bound-
layer of the atmosphere in the Arctic is expected to clarify some new concepts of the meteoro-
cal properties of the air layer near the ground. The meteorological characteristics of the winter
summer periods were outlined from data compiled by the expeditions of the Geophysical Ob-
atory and the Arctic Scientific Research Institute, in the winter of 1955 on drifting station
5 and in the summer of 1956 on SP-4. The profiles of meteorological elements in the air
r near the ground in snow and ice were obtained. The studies of radiative balance in the
wave range revealed a black body radiation at 0° in summer. In winter, a deep inversion
a negative radiative balance were observed. The regime of temperature and wind at a
ionary state of the boundary layer was analyzed. A slight difference between daily fluctuations
hort wave radiation was found in the boundary layer, as well as uniform physical properties
he active surface and a steady temperature of the lower boundary of the active layer equal to
freezing temperature of brine. *Subject Headings:* **1. Air layer near the ground 2. Arctic.
Mitchell, George S.** (*transl.*) **II. Donehoo, Irene A.** (*transl.*)—*S.N.*

12N–34 551.511:551.551:551.510.522

Liu, Chen-Hsing (*Inst. Geophys. Meteor. Academia Sinica*), **The regularity of the atmos-
ric turbulent exchange in the surface layer.** *Science Record,* Peking, China, 2(5):175–
1958. 7 p. photostat of separated pages. fig., 14 refs., 24 eqs. **DWB** (M51 C518re)—
ng summary of a theoretical thesis on the turbulent exchange in a stable layer of air near the
ace of the Earth and in a convective (unstable) layer. The distribution of wind speed, tem-
ture, and humidity under different lapse rates is shown graphically, according to several
ods of calculation, the author's formulas for stable and unstable stratification, etc. The
nate separates the stable cases from the unstable. *Subject Headings:* **1. Turbulent exchange
table air 2. Stability effects on turbulent exchange.**—*M.R.*

12N–35 551.511:551.557:551.5

Martin, D. W., **Errors in the geostrophic vorticity calculated at 100 millibars.** *Meteorological Magazine,* London, 87(1034):231–233, Aug. **1958.** refs., 3 eqs. **DWB, DLC**—The standard error in the geostrophic vorticity at 100 mb in the neighborhood of the British Isles, due errors in the winds used in drawing the contour charts, is estimated to be about 10% of Coriolis parameter. *Subject Heading:* **1. Geostrophic vorticity.**—*Author's abstract.*

12N–36 551.511:551.518:53

†Panchev, St., **Vŭrkhu edna grupa elementarni chastni resheniia na uravnenieto na bulentnata toploprovodnost v atmosferata.** [On a group of elementary solutions of the eq tion of turbulent heat transfer in the atmosphere.] *Khidrologiia i Meteorologiia,* Sofia, No. 4 57, **1958.** 6 tables, 4 refs., 38 eqs. Russian and English summaries p. 57. **DLC**—By a suit substitution of the variables in the equation of atmospheric turbulent transfer of heat, the equa is reduced to a common differential equation of the second order, which is suitable for immed integration. A series of values for the parameter E is found, which corresponds to unst equilibrium in the atmosphere, and with which the equation can be solved by elementary functi or a sum of them and of the functions $\phi(u)$ and $Ei(u)$. These particular solutions may utilized for obtaining the general solution of specific problems. *Subject Heading:* **1. Turbu transfer of heat.**—*Author's abstract.*

12N–37 551.511:551.573:55

Timofeev, M. P., **Teplovoĭ balans vodoemov i metody opredeleniia ispareniia.** [The balance of water reservoirs and methods of determining evaporation.] (In: Leningrad. Glav Geofizicheskaia Observatoriia, **Sovremennyi problemy meteorologii prizemnogo sloia vozdu** Leningrad, **1958.** p. 43–60. 8 figs., table, 26 refs., 43 eqs.) **DLC** (QC982.7.L4) Transl. English by George S. Mitchell and Nina A. Stepanova Zikeev, Wash., D. C., U. S. Wea Bureau, Aug. **1960. DWB** (M26.7585he)—The equation of the thermal balance of water re voirs was derived and analyzed as a basis for determining the evaporation from the water sur Empirical formulas were tabulated showing the evaporation rate from the water surface in tion to wind velocity. *Subject Headings:* **1. Evaporation from water surfaces 2. Evapora rate-wind velocity relationships. I. Mitchell, George S.** (*transl.*) **II. Zikeev, Nina A. St nova** (*transl.*).—*S.N.*

12N–38 551.511:551.557:551.5

Asplund, Stanley E., **A numerical experiment in deduction of the divergence associ with a model of a steady cold cyclone.** Florida. State Univ. Dept. of Meteorology, Con Nonr-1600(00), Technical Report No. 14, Jan. 21, **1959.** 180 p. 41 figs., 7 tables, 62 refs eqs. **DWB**—The tropospheric wind structure in a subclass of cutoff cold-core cyclones is idea in a model, which is a hypothetical case in which velocity divergence is present in exactly right amount to maintain a zero local rate of range of vorticity. The rotational nondivergent of the total wind field is prescribed. The divergent irrotational part is obtained by an iter numerical process based upon evaluation of divergence from the vorticity equation. Begin with the lower-boundary assumption of vertical velocity, the divergence required to balanc other contributions to vorticity tendency is computed at 100 mb intervals. Successive pre surfaces are linked by numerical integration of the continuity equation. Computations and re through 500 mb are reported and discussed. The model wind field is prescribed by mathem expressions for zonal wind superimposed on a vortex at a reference surface of 565 mb. part of the wind field varies with height. At each pressure a given part has a fixed ratio t value at the corresponding point of the reference surface. The observational basis and considerations leading to selection of this model are discussed. Vertical motion at the 90 lower boundary is obtained as the result of convergence in the friction layer, using the El spiral theory. Zero lateral boundary values are assumed for the divergent wind field. The ticity and continuity equations in the (x, y, p, t) coordinate system are adapted to a finite-diffe lattice established upon a selected Lambert Projection. The first approximation to diverg balances the advection of vorticity by the model wind field. "Divergence-linked" effects evaluated by a method of successive approximations devised for the purpose. Values of ve motion obtained by numerical integration of the continuity equation are used in computatio vertical motion effects. The irrotational divergent wind field corresponding to approxi divergence is obtained by relaxation solution of Poisson-type equations. The results presente the divergence required to balance advection of vorticity by the nondivergent wind, additional tributions by vertical motion effects and divergent wind advection of vorticity vertical motion divergent wind. The empirical evidence of the experiment in regard to the overall iterative cedure is examined. Results are interpreted in terms of success of the numerical process, in tions of what is important in a model, and meteorological significance. It is concluded that fu

studies and deductions of structure by numerical process, built upon this exploration, will be itable. *Subject Headings:* **1. Tropospheric wind structure models 2. Wind field theories yclone models.**—*Author's abstract.*

12N–39 551.511:551.558:551.524.72:551.515.82

Burtsev, A. I. and Popova, T. P., **Rol' uporiadochennykh vertikal'nykh dvizheniĭ i advekt-v evoliutsii termicheskogo polia vo frontal'nykh zonakh.** [The role of stabilized vertical ements and advection in the evolution of the thermal field in frontal zones.] *Moscow.Tsen-'nyĭ Institut Prognozov, Trudy,* No. 79:33–43, **1959.** 6 figs., table, 8 refs. **DWB**—The varia-s in the thermal field of the low and middle troposphere are affected not only by advection but by adiabatic changes in temperature during vertical movements of air. These movements in region of the atmospheric fronts have been investigated many times, using various methods and erent equations. The authors of the present paper compute the vertical velocities in the frontal e by means of a consideration of the stabilized vertical movements of nonstationary atmospheric ditions. This method takes into account existing frontal zones with a large horizontal tem-ature gradient. On the basis of the quantitative computation of the vertical velocities in the atmosphere, the authors attempt to determine the distribution of the vertical component of movements in the field of the actual frontal zone up to the height of 200–300 mb. These com-ations confirm the assumed role of vertical movements in the evolution of the thermal field of frontal zone and correct the formulas for stabilized vertical movements. The proposed methods described in detail. *Subject Headings:* **1. Frontal zone movements 2. Vertical component ir movements 3. Thermal structure of frontal zones 4. Tropospheric advection.**—*N.P.S.*

12N–40 551.511:551.558.1:551.577.1

Chelam, E. V. (*Met. Office, Begunmpet*), **Vertical velocity and rainfall computations.** (In: posium on Meteorological and Hydrological Aspects of Floods in India, New Delhi, April 8, **Proceedings.** Delhi, Indian Meteorological Dept., **1959.** p. 178–179. 2 refs., 7 eqs.) /B (M79.4 S989pr)—In any flood warning scheme, it is important to be able to estimate quan-tively the magnitude of likely rainfall over an area from a vertically ascending mass of satu-d air. Fulks (1935), and Showalter (1944) have developed formulas for this purpose but r basic assumptions either ignore the horizontal wind field or treat it as nondivergent. Such mptions are open to serious objections considering the fact that the observed wind field is om nondivergent; moreover, no appreciable vertical velocities (which alone could lead to rain-) should be expected in a nondivergent wind field. A formula is derived without recourse to assumptions about nondivergence of the wind field. *Subject Headings:* **1. Flood warning nulas 2. Rainfall computation techniques.**—*E.Z.S.*

12N–41 551.511:551.510.522

*Dobosi, Zoltán, **A mikroadvekció jelentkezése a talajközeli légrétegben.** [Small scale ad-tion in the air near the ground.] *Időjárás,* Budapest, 63(4):222–225, July/Aug. **1959.** fig., bles, 4 refs. Hungarian and Russian summaries p. 222. **DLC**—The frequency of gradient s lacking advection, and of those modified by advection is presented from observations made Erdöhátpuszta. The occurrence of a daily and a yearly course is demonstrated. *Subject Head-:* **1. Advection near the ground. 2. Erdöhátpuszta, Hungary.**—*Transl. of Hungarian sum-y O.T.*

12N–42 551.511:551.524:536.24

*Dolgin, I. M., **O stepeni teplovoi transformatsii na vysotakh v Arktike.** [The degree of transfer aloft in the Arctic.] *Leningrad. Arkticheskii i Antarkticheskii Nauchno-Issledo-l'skii Institut, Trudy,* 226:66–75, **1959.** 6 tables, 11 refs., eqs. **DLC** (G600.L4 t. 226)—t transfer, i.e. intensive heat exchange between the underlying surface and the moving air ses, particularly at high altitude, was studied in the Arctic for synoptic purposes. The results ined showed the ratio $\Delta Tz/\Delta To$, varying unevenly along the vertical. Layers with decreasing os were found at altitudes between 0.2–3 km and above 11 km. Between these regions were rs with an increasing degree of transfer. *Subject Headings:* **1. Heat transfer measurements rctic.**—*S.N.*

12N–43 551.511:551.551.8:551.578.46(98)

†Doronin, Iu. P., **O termicheskoi transformatsii nizhnego sloia atmosfery v Arktike enne-zimnii period).** [Thermal transformation in the lower layer of the atmosphere in the tic (fall-winter period).] *Leningrad. Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii itut, Trudy,* 226–76–98, **1959.** 4 figs., 15 refs., 71 eqs. **DLC** (G600.L4 t.226)—Transl. into lish by Richard M. Holden, issued by American Meteorological Society under Contract AF

19(604)-6113, March **1960.** 28 p. Complete.—The temperature variation of an air mass mo over snow covered ice was analyzed. Equations of hea transfer were derived by using L Laikhtman's coefficient of turbulent exchange (*Leningrad. Glavnaia Geofizicheskaia Observato Trudy,* No. 56, **1956**) by inserting the value of the velocity of the ice cover growth obtained a system of equations, and taking the heat conductivity of snow according to Abbel's formula N. Tverskoĭ, *ed.,* **Kurs Meteorologii** [Course of meteorology], **1951.** (For abstract, *see* 3 10, March, 1952, *Met Abs.*) Absolute values of the transformation of an air mass, computed a height of 2 m, are presented in a graph. *Subject Headings:* **1. Air flow over snow c 2. Snow cover effects on temperature variations 3. Thermal transformation in air layer the ground. I. Holden, Richard M.** (*transl.*)—*S.N.*.

12N–44 551.511:551.551.8:551.324.412

*Doronin, Iu. P., **Turbulentnyĭ teploobmen mezhdu ledianym pokrovom i atmosf** [Turbulent heat exchange between an ice cover and the atmosphere.] *Leningrad. Arktich i Antarkticheskiĭ Nauchno-Issledovatel'skiĭ Institut, Trudy,* 226:19–29, **1959.** 5 figs., 2 tabl refs., 22 eqs. **DLC** (G600.L4 t. 226) Transl. into English by Roy Flagg, issued by Ame Meteorological Society under Contract AF 19(604)-6113, March **1960.** 16 p. Complete.— ficiently reliable data on heat exchange between an ice cover and the atmosphere in the A were obtained from standardard meteorological observations and by using structural and s empirical formulas. The data required for semiempirical formulas were obtained by stan meteorological reading devices. *Subject Headings:* **1. Turbulent heat exchange data 2. Au I. Flagg, Roy** (*transl.*)—*S.N.*

12N–45 551.511:

*Gilmore, F. R., **Additional values for the equilibrium composition and thermodyn properties of air.** *Rand Corporation, Santa Monica, Calif., Research Memorandum,* RM- Dec. 30, **1959.** 15 p. 8 tables, 12 refs. **DWB**—Supplementing RM-1543, values of the librium composition and thermodynamic properties of air are presented at two additional peratures, 10,000 and 50,000°K. The pure ideal gas properties needed for these calculation included. Equilibrium values for the principal charged particles at 1000 and 2000°K, and the CN molecule between 1000 and 8000°K are also listed. Finally, the thermodynamic prop of air between 1000 and 10,000°K at high densities (10 to 316 times standard density) are lated. These properties are calculated to include approximate corrections for the intermole interactions. *Subject Headings:* **1. Equilibrium composition of air 2. Thermodynamic p erties of air.**—*Author's summary.*

12N–46 551.511:551.547:551.

Godwin, John Bicknell, Jr., **Branching and interaction of velocity maxima in the at phere. 1959.** Thesis (M.S.)—St. Louis University. 39 p. incl. illus. Available as AS AD-214 034.—A study was made of the effects which various patterns of velocity maxima on the speeding up or slowing down of the wind maximum (called the jet stream). The int in these patterns arose from the introduction of the confluence theory of jet stream forma Constant-level charts for each km, 5–20 km, were plotted and analyzed for Oct. 23 and Oct 1957. These constant level charts were then used to construct vertical cross sections along of constant longitude. The charts and cross sections give a 3-dimensional synoptic ana including time continuity for the study of velocity maxima interaction. Four basic ve maxima patterns were observed in this study: (1) straight flow, (2) simple wave pattern, simple confluent branch, and (4) simple diffluent branch. *Subject Headings:* **1. Wind vel patterns 2. Jet stream.**—*Author's abstract.*

12N–47 551.511:551.515.1:551.556.8:551.465

Ivanov, Iu. A. and Tareev, B. A., **K voprosu o strukture zony antarkticheskoĭ diverge** [Structure of the zone of Antarctic divergence.] *Akademiia Nauk SSSR, Izvestiia, Ser.* No. 6:82–89, Nov./Dec. **1959.** 2 figs., 2 tables, 4 refs., 11 eqs. **DWB**—The authors investi the characteristics of the Antarctic zone of divergence by proceeding from typical maps of sure systems which enabled them to delineate the stable position of cyclonic centers and to as that the total wind action resulting from a pressure, actually varying with time, can be rep by the wind effect averaged for this period. An equation is derived for computing the up and downward velocity of water and a graph showing the variation of pressure gradient cyclone. The corresponding distribution of vertical velocity components at the Ekman fri depth is presented. Patterns of distribution of the zones of rise and fall of water based calculations of upward and downward vertical water velocities are presented and the charac tics of divergence and their importance in whaling are discussed. *Subject Headings:* 1.

gence analyses 2. Wind effects on ocean currents 3. Whaling 4. Antarctic zone of ergence.—*I.L.D.*

12N–48 551.511:551.543:551.515.23

Kliucharev, S. S., **O prichinakh izmeneniia atmosfernogo davleniia u poverkhnosti zemli.** auses of the changes in atmospheric pressure at the Earth's surface.] *Meteorologiia i Gidro-ia*, Moscow, No. 10:8–12, Oct. **1959.** 2 figs., 4 refs., 3 eqs. **DWB, DLC**—The author derives differential equation expressing physical processes which involve pressure changes, based on ological data obtained from an area near Moscow. The first term of this equation corresponds advective pressure charges, and the second to dynamic changes; the first is dependent upon air vements with mean wind velocity, and also upon the mean wind divergence. The advective n is computed, using values of mean wind and surface pressure gradient. The concept of ering, widely used in synoptic work, becomes much clearer when considered in light of this erential equation. It is concluded that steering current corresponds to the vector of mean wind. s concept might be useful in forecasting, especially in connection with dynamic pressure nges. *Subject Headings:* 1. **Pressure change calculations 2. Steering current 3. Moscow, S.S.R.**—*N.P.S.*

12N–49 551.511:551.510.535

London, Julius; Haurwitz, Bernhard and Ooyama, Katsuyuki, **Dynamics of the mesosphere.** w York Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanog-hy, Contract AF 19(604)-1738, Final Report, Dec. **1959.** 37 p. 3 figs., eqs. **DWB**—Presents ummary of various phases of research done over a 3-yr period (Jan. 1956–June 1959) in an mpt to analyze and interpret the observational data in terms of the dynamics and energetics he upper atmosphere. The report is divided into 5 sections covering the main phases of the ject research. These deal with: 1) the radiation budget of the upper atmosphere; 2) the ribution of atmospheric ozone; 3) motions in the upper atmosphere; 4) studies of atmospheric es; 5) solar-weather relationships. Scientific reports published under this contract were: No. Ohring, George, **Radiation budget of the stratosphere,** June **1957.** (For abstract *see* 9.9–, Sept. 1958, *Met. Abs.*); No. 2, Haurwitz, Bernhard; London, Julius and Valovcin, F., **sonal variation of the vertical ozone distribution at Flagstaff, Arizona,** June **1957.** (For tract, *see* 10F–97, June 1959, *Met. Abs.*); No. 3, Siebert, Manfred, **Tidal oscillations in an osphere with meridional temperature gradient,** July **1957.** (For abstract, *see* 10.2–238, . 1959, *Met. Abs.*); No. 4, Siebert, Manfred, **A planetary representation of the terdiurnal iations of atmospheric pressure and temperature,** July **1957.** (For abstract, *see* 9.11–216, . 1958, *Met. Abs.*); No. 5, Haurwitz, Bernhard, **Horizontal advection and the motion of ssure and flow patterns,** Oct. **1957.** (For abstract, *see* 12N-28); No. 6, Ooyama, Katsuyuki, **the vertical propagation of a disturbance through the mesophere,** Sept. **1958.** (For ab-ct, *see* 12.8–407, Aug. 1961, *Met. Abs.*); No. 7, Haurwitz, Bernhard, **The semidiurnal pres-e oscillation in the stratosphere,** Oct. **1958.** (For abstract, *see* 12.1–289, Jan. 1961, *Met.* .); No. 8, London, Julius; Ruff, Irwin and Tick, Leo J., **The relation between geomagnetic iations and the circulation at 100 mb,** Feb. **1959.** (For abstract, *see* 11.7–157, July 1960, . *Abs.*) *Subject Heading:* **1. Dynamics of the mesosphere.**—*M.F.H.*

12N–50 551.511:551.513.1:551.551

Slobodov, B. I., **O godovom khode tsentrov deistviia turbulentnoi atmosfery.** [Annual ation of the centers of action of a turbulent atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Geofiz.*, No. 10:1522–1525, Oct.**1959.** 4 refs., 22 eqs. **DLC**—The problem of annual varia-s in atmospheric pressure distribution was discussed in 1954 by E. N. Blinova. In the present k, the author has made an attempt to solve the problem of the center of action of the atmos-re with greater precision while considering turbulent exchange along the vertical and taking clinicity into full account. Moreover, various parameters such as the circulation index, roturbulence coefficient, zonal temperature drop between the pole and equator (M) and also coefficient of turbulent friction along the vertical, were considered as a periodical function of . Three basic differential equations: (1) the equation of vertical vorticity; (2) equation for udinal movement; and (3) equation of continuity were simplified with corresponding meaning he constant coefficients and reexpressed by algebraic equations with more simplified constant ficients. In the final equations some terms depending on time are small and can be neglected; efore, the problem of annual pressure distribution appears as quasi-stationary. *Subject Head-:* **1. Pressure distribution 2. Atmospheric turbulence.**—*N.P.S.*

12N–51 532.517.4 551.511:551.551

Squire, William (*Bell Aircraft Corp., Buffalo, N. Y.*), **A unified theory of turbulent flow, I, Formulation of the theory.** *Applied Scientific Research, Ser. A,* The Hague, Vol. 8, pub.

1959. p. 159–168. 18 refs., 22 eqs. **DWB, DLC**— A critical analysis is made of the assu tions underlying Reynolds equations for turbulent flow. It is shown that there are regions i flow field where these assumptions break down, and it is therefore necessary to separate the f into a turbulent core and a laminar sublayer. The importance of the boundary conditions to imposed on the mean velocities and Reynolds stresses at the junction is emphasized, as this the way in which the effect of surface roughness enters the theory. A set of equations for culating turbulent flow is proposed. The distinctive feature is that the turbulent stresses represented as the difference between viscous terms with a large eddy viscosity and terms satis ing auxiliary differential equations proposed by BROSZKO. These terms may be associated with free and wall turbulence respectively. The theory enables the idea of a large eddy viscosity to applied even where the velocity gradient is large. The results obtained for specific configurati which will be reported in detail in future papers, are previewed. *Subject Heading:* **1. Turbul flow theories.**—*Author's summary.*

STATICS AND QUASI-STATICS (551.511.1)

12N–52 551.5

Ackermann, Paul (*Payerne*), **Das indifferente Gleichgewicht der Atmosphäre.** [Indiffe equilibrium of the atmosphere.] *Meteorologische Rundschau,* Berlin, 12(5) :142–143, Sept./ **1959.** fig., ref., 4 eqs. **DWB, DLC**—It is explained that static equilibrium is identical indifferent equilibrium. The physical cause for the deviation from the classical adiabatical atm sphere is clarified. Computations emphasize the difference, first for a force of gravity acting pendicular to a plane, then for centrifugal force. The acceleration of gravity is a constant, we assume an ideal gas. *Subject Headings:* **1. Statics 2. Stability of the atmosphere.**—*E.*

12N–53 551.5

Filipovich, O. P., **O nekotorykh tipakh ravnovesnykh sostoianiĭ atmosfery.** [Some ty of equilibrium states in the atmosphere.] *Leningrad. Universitet, Vestnik,* No. 10, **1959.** p. 62. 2 figs., 8 refs., eqs. (No. 2 of subseries, *Seriia Fiziki i Khimii*) **DLC** (AS262.L4 **DWB** (M11.3F483on)—A brief summarization of the physical nature of some equilibrium sta thermodynamic equilibrium; local thermodynamic equilibrium; monochromatic ray equilibrium mixed type of equilibrium and the stationary state occurring in the Earth's atmosphere. *Sub Headings:* **1. Stability of the atmosphere 2. Equilibrium states 3. Atmospheric equilibr states.**—*E.Z.S.*

12N–54 551.511.1 :551.51

Mesinger, F. (*Meteor. Inst. Univ. Belgrade, Yugoslavia*), **Some remarks on the hy dynamic instability in "strong" circular anticyclones.** *Időjárás,* Budapest, 63(6) :321– Nov./Dec. **1959.** fig., 4 refs., 16 eqs. French summary p. 321; Hungarian summary p. 327– **DLC**—Discussion of an axially symmetrical anticyclone, assuming that the air is statistically sta The author established the criterion for the hydrodynamic instability of the permanent, horizo isobaric motion in a new form, based on a criterion derived by VAN MIEGHEM. This poses problem: Is the instability, thus determined, a "marked" instability in the sense of GODS criteria, or is it not? As a result of a consideration of this problem, a picture of the mecha of a strong anticyclone formation is suggested. The latter is associated with a strong fiel "perturbation diversion" superimposed on the ambient field of mass convergence, which tend prevent further increase of the anticyclonality. *Subject Headings:* **1. Hydrodynamic instab in anticyclones. 2. Strong circular anticyclones 3. Instability criteria.**—*Based on aut abstract.*

Hydrostatics. Standard Atmospheres (551.511.12)

12N–55 551.511.12 :551.501.7 :551

Gubin, V. I., **Predvychislenie geopotentsial'nykh vysot izobaricheskikh poverkhno** [Forecasting geopotential heights of isobaric surfaces.] *Sredneaziatskii Nauchno-Issledovate Gidrometeorologicheskii Institut, Trudy,* No. 2(17) :92–98, **1959.** 4 figs., ref., 25 eqs. D (M(055) U581ts) Transl. into English available, U. S. Office of Technical Services. Price: $.50.—The author examines the finite difference solution of equations on the two- model in order to compute the terms describing variation of vertical velocity along an iso surface. The calculations were carried out on an electronic computer and isobaric surface 300 and 700 mb for Nov. 15 and 16, 1954 were used to forecast the isobaric surfaces for 16 and 17, 1954, respectively. The fundamental equations were derived. The solution and putation of the geopotential height is illustrated and the forecast and actual AT_{700} charts have presented and compared. The comparison shows that the agreement is fully satisfactory q tatively and, within the limits of accuracy, the quantitative agreement of fields is also satisfac

bject Headings: 1. Isobaric surfaces 2. Dynamics of the atmosphere 3. Geopotential ght calculation techniques.—*I.L.D.*

Static and Quasi-static Thermodynamic States and Processes (551.511.13)

12N–56 551.511.13:536.1:551.513

Starr, Victor P., **Mathematical theory of convection.** *Journal of Meteorology*, 6(3):188–?, June **1949.** fig., 6 refs., 28 eqs. **DWB.** Also in: Massachusetts Institute of Technology, pt. of Meteorology, Contract AF 19(122)-153, Studies of the Atmospheric General Circulation, nal Report, Pt. 1, May 31, **1954.** p. 430–434. **DWB**—Since the motions of the atmosphere olve the presence of external heat sources and heat sinks, it is important to incorporate these ects into the hydrodynamical theory of air motions. In the discussion contained in this paper nethod for accomplishing such a synthesis of hydrodynamics and thermodynamics is formulated the case of two-dimensional motion. The use of the method is illustrated by an exact integra- n of the equations for the case of a circular vortex. Possible further elaborations of the method discussed with a view of throwing light upon the fundamental nature of the general circulation the atmosphere. *Subject Headings:* 1. **Convection theories** 2. **Heat sources and sinks Hydrodynamics** 4. **General circulation.**—*Author's abstract.*

12N–57 551.511.13

Ozorai, Zoltán, **Nem-adiabatikus gradiensű légoszlop szétterülése.** [Spreading of a column air having a nonadiabatic gradient.] *Időjárás*, 57(3):129–133, May/June **1953.** 16 eqs. ssian and French summaries of spreading cold air masses. A column of air is investigated ose temperature gradient is smaller than its adiabatic gradient. After determining the ap- oximations which can be achieved by theoretical means, the author examines a particular case l defines the changes in the form of the air column, as well as the relation of its height to cross section. *Subject Heading:* **Thermodynamics of the atmosphere.**—*Transl. of author's stract.*

12N–58 551.511.13:551.524:551.525

Maruyama, E. and Takasago, M. (*Central Met. Obs., Div. of Industrial Met.*), **On the rangement for measuring the thermal diffusivity.** *Japan. Central Meteorological Observa- y, Tokyo, Memoirs of Industrial Research*, 19(1):31–34, Dec. **1955.** 2 figs., table, 2 refs., eqs. Japanese; English summary p. 34. **DLC.** Also issued in: *Journal of Agricultural Meteorol- y*, Tokyo, 11(4):121–123, March **1956.** 2 figs., tables, 2 refs., 2 eqs. In Japanese; English mmary p. 123. **DWB**—The authors have computed the thermal diffusivity of soil by using an uation. The difficulty arises in an attempt to get accurate values, since they used a glass rmometer. A combination of 2 thermocouples was devised, in order to get accurate values. il moisture was measured by the soil moisture ohmmeter (Fiberglas Soil Moisture Unit, Models and 375). Observations show that the diffusivity of the soil decreases with the increase of soil isture, as long as the water content is greater than 28%. *Subject Heading:* **1. Thermal dif- ivity of soil measurement techniques.**—*From authors' abstract.*

12N–59 551.511.13:551.515.71

Sakuraba, Shin-ichi (*Central Met. Obs.*), **The role of vertical stability in the development a great anticyclone.** *Geophysical Magazine*, Tokyo, 26(3):225–230, March **1955.** fig., 2 refs., eqs.—As a sequel to the author's paper: **The effect of radiational cooling on the development a great anticyclone** (*Geophysical Magazine*, Tokyo, 26(2):103–107, Feb. **1955.** 3 refs., 16 .), it is shown here that the magnitude of the radiational cooling rate necessary for anticyclonic velopment depends on the vertical stability. For example, when the lapse rate is 6°C/km the nimum value of the rational cooling rate necessary for the development of the anticyclone is 5°C/day, while, when the lapse rate is 8°C/km, it is 0.7°C/day. It is found that, as the lapse e approaches the dry adiabatic lapse rate, the minimum value of radiational cooling rate becomes aller. *Subject Headings:* 1. **Anticyclone development** 2. **Adiabatic cooling** 3. **Radiational oling.**—*Author's abstract*

12N–60 551.511.13

Efimova, N. A., **Seminar po teplovomu balansu.** [Seminar on thermal balance.] *Meteoro- ia i Gidrologiia*, Leningrad, No. 3:63, March **1956. DWB, DLC.** Transl. into English avail- e **DWB** (M:536 Y43se)—The seminar on heat balance has been conducted since 1954 under chairmanship of M. I. Budyko at the A. I. Voeĭkov Central Geophysical Observatory. During period of 2 yrs some 40 papers were presented on various aspects of this subject. One session s devoted to K. Ia. Kondrat'ev's **Radiant Energy of the Sun.** Problems dealing with radia-

tional balance, daily and annual variations of heat balance, etc. were considered. *Subject Headi* **1. Heat balance.**—*I.L.D.*

12N–61 551.511.13:551.501.3:551.

Goff, John A. (*Prof. Mech. Eng., Pa. Univ.*), **Saturation pressure of water on the n Kelvin temperature scale.** *American Society of Heating and Air-Conditioning Engineers, Tra actions,* 6:347–354, **1957.** 2 figs., 2 tables, 15 refs., 7 eqs. **DWB, DLC**—Tables give correct Δp to be added to Goff-Gratch 1946 (IMO, 1947) values of saturation pressure of water w respect to liquid and with respect to ice, at 10° temperature intervals from 0–100°C, and at 2(intervals from 0 to — 180°C, respectively. The newly amended values are recommended by WMO Aerological Commission, 2nd session, June 1957. Corrections are plotted on graphs details of new formula set forth and explained. Other international commissions have adop the new corrections. *Subject Headings:* **1. Saturation pressure of water 2. Saturation pr sure over ice.**—*M.R.*

12N–62 551.511.13:551.

Cădež, Marjan (*Professor of Met., Univ. Belgrade*), **Internal and external influences weather development.** *Időjárás,* Budapest, 62(3):129–134, May/June **1958.** 2 refs., 12 **DLC**—In addition to the energy supply from the sun and ground surface, there are other exter forces affecting weather development over a large area. Such a force is the internal and kin energy flux associated with the propagation of pressure waves. The sum of this internal kinetic energy can conveniently be called planetary internal energy. The intensity of the ene flux, and the velocity of the atmospheric motion associated with it, may be calculated from expressions developed in this paper. Consideration of this energy flux may possibly contrib to an improvement of weather forecasts. *Subject Headings:* **1. Kinetic energy flux 2. La scale weather processes.**—*Transl. of author's abstract.*

12N–63 551.511.13:533

Chapman, Sydney, **Thermal diffusion in gases.** (In: Cambel, Ali Bulent and Fenn, J B. (*eds.*), **Transport properties in gases.** Evanston, Ill. Northwestern Univ. Press, 19 p. 143–150. 14 refs. **DWB** (523.74 C719gr)—After a brief historical introduction and bibli raphy, the main characteristics of thermal diffusion in binary gas mixtures are reviewed. Ther diffusion depends more than most gas phenomena on the precise nature of the forces between unlike molecules. Hence it is a useful tool in investigating such forces. This is one main inter in the study of thermal diffusion. In experiments for this purpose, binary mixtures are obviou the most appropriate. A second main interest of thermal diffusion is its use in separating ga particularly isotopes. The thermal diffusion column is a very convenient apparatus for this p pose. The separation of rare isotopes can be facilitated by introducing additional gases i isotopic mixtures. There is need for further theoretical and computational study of ther diffusion in binary mixtures of low density, and still more in such mixtures at higher densit and in multiple mixtures. Thermal diffusion may be a disturbing factor in experiments for q different purposes, involving gas mixtures at nonuniform temperature. The influence of ther diffusion in nature (e.g., in stellar interiors and in the Earth's atmosphere) has been briefly plored. So far as I know, little consideration has been given to its influence in aerodyna phenomena. *Subject Heading:* **1. Thermal diffusion in gases.**—*Author's abstract.*

12N–64 551.511.13:53

Favre, A., **Equations statistiques des gaz turbulents: enthalpies, entropie, températur** [Statistical equations of turbulent gases: enthalpy, entropy, temperatures.] *Académie des S ences, Paris, Comptes Rendus,* 246(23):3216–3219, June 9, **1958.** 3 refs., eqs. **DLC**—The tistical equations of enthalpy, generative enthalpy, entropy, and temperature concern a gas which the speed, specific gravity, pressure, internal energy, volume force, viscosity, conductiv and specific heat may be macroscopically variable and turbulent. The equation of the generat temperature concerns the case when the specific heat remains constant. *Subject Headings:* **Turbulent flows of gases 2. Enthalpy 3. Entropy 4. Gas temperatures.**—*A.V.*

12N–65 551.511.13:551.510.62:551.501

Marshall, J. S. and Carey, G. O. (*both, Stormy Wea. Group. McGill Univ.*), **A graphi study of convective overturning.** *Weather Radar Conference, 7th, Miami Beach, Florida, N 17–20, 1958, Proceedings,* issued **1958.** Sec. D:37–40. 5 figs. **DWB** (M01.81 R124 pc, 19 —A stable atmosphere was assumed, except for a superadiabatic lapse rate in the lowest 100 Then the superadiabatic layer was removed, in graphical development, by adiabatic ascent matching subsidence, with no mixing of rising air with its environment. The cycle was repea

y times. The resulting pattern was compatible with a stratum of angels steadily increasing eight, and then the appearance of cumulus clouds. Apart from the superadiabatic lowest layer, lapse rate was always on the stable side of adiabatic below cloud base and on the stable side saturated adiabatic above cloud base. A considerable portion of the cloud that formed, dis-eared through subsidence in the subsequent overturning. *Subject Headings:* **1. Convective vity 2. Radar angels**—*Authors' abstract.*

12N–66 551.511.13:551.547:551.524.7

Zikmunda, Otakar (*Geoph. Institut, Prague*), **Velichina i vazhnoe znachenie neadiabati-skogo chlena v sloe 100–50 cb.** [Magnitude and importance of the nonadiabatic term in -50 cb layer.] *Geofysikální Sborník,* Prague, **1958,** issued **1959.** p. 457–472. 7 figs., table, efs., 6 eqs. Czech and English summaries p. 470–472. **DWB**—From the equation of the kness tendency, and Eliassen and Hubert's equation for calculating vertical velocities, the rage nonadiabatic changes in the 100–50 cb layer are calculated. The results of the calculation average periods of 12 and 24 hrs are illustrated. It is shown that the calculated nonadiabatic esses can cause changes in the thickness of the relative topography, which in isolated points s much as 400 m in 12 or 24 hrs. A table contains the correlation coefficient R between the al 12 hr thickness tendency and the corresponding terms of the equation. *Subject Heading:* **Ionadiabatic processes.**—*E.Z.S.*

12N–67 551.511.13:551.515.8:551.513

Chen, Lung-shun (*Inst. of Geophys. & Met. Acad. Sinica*), **The instability of the large scale urbances in atmosphere.** *Acta Meteorologica Sinica,* Peking, 30(1):85–91, Feb. **1959.** 6 ., 13 eqs. In Chinese; English summary p. 91. **DLC**—In this paper, the necessary instability eria of large scale atmospheric disturbances in a baroclinic zonal current with horizontal shear discussed. Moreover, the effects of unstable and stable disturbances on the general circulation he atmosphere are also considered. *Subject Headings:* **1. Atmospheric disturbance effects general circulation 2. Instability criteria.**—*Author's summary.*

12N–68 551.511.13

Hoeppner, Helmut (*Sr. Scientist for Astronautics with Chrysler Corp. in Detroit Mich.; onaut. Eng. in Redstone Arsenal, and Ed. of Space Journal*) and Isbell, B. Spencer, **Is time missing link? Pt. 1, Displacement energy.** *Space Journal,* Nashville, Tenn., 2(1):31–39, t. 1959. 4 figs., eq.—A discussion intended to lead to a confirmation of the proposition that e is the missing link to a unified field theory. The authors prove their point by showing the equacy of the old version of the law of conservation of energy. The old version led to sfactory results until nuclear physics attempted to unify the physical sciences. Two kinds of rictions, i.e., the concept of "entropy" and "displacement current" have already been suggested. ddition to these two classical restrictions to the energy law, the authors recently introduced an ogy to "displacement current" in to the field of astrodynamics. The new parameter, called placement energy" is also a time parameter since it is the energy required to move, redis-ıte, or displace pure energy during an occurrence (state of non-equilibrium). *Subject Head-:* **1. Displacement energy 2. Energy conservation law.**—*I.S.*

12N–69 551.511.13:551.510.62

Plank, V. G. (*AF Camb. Res. Center, GRD, Mass.*), **Convection and refractive index in-ıogeneities.** *Journal of Atmospheric and Terrestrial Physics,* N. Y., 15(3/4):228–247, Oct. . 10 figs., 2 tables, 33 refs. **DLC**—The concepts of convection: the "parcel method," the e method," and entrainment appear to be less satisfactory than the bubble theory of penetra-convection, presented by Scorer and Ludlam (1953). Evidence supports their theory. al and subsequent development with and without shear are explained and are followed by a ıssion of the importance of environmental humidity. The refractive index difference between d and environment will simply be the humidity difference converted into index. The humidity itions determine the general refractivity of the convective atmosphere. Perhaps the most ıctive situation would be one where the cumuli build through an environment composed of nate, horizontally stratified moist-dry layers. Finally, the structure of the refractive index ient regions in a convective atmosphere are considered. The important gradients are right at cloud boundary. The discussion of R. L. Smith-Rose, J. S. Marshall, and D. Atlas h the presentation. *Subject Headings:* **1. Convection 2. Refractive index inhomogeneities.** *Z.S.*

12N–70 551.511.13:551.574.1:551.576.1

Stanchev, K., **Kondensatsionno nivo i liniia na sŭstoianieto.** [Condensation level and the rate curve.] *Khidrologiia i Meteorologiia,* Sofia, No. 3:22–30, **1959.** 8 refs., 17 eqs. Rus-

sian and English summaries p. 29–30. **DLC**—This article is part of a more comprehensive st of the problem of falling of precipitation from convective clouds. The problem of the mar of the changing of temperature, humidity and the condensation level in the rising air curren discussed. It is assumed that the surrounding air is sucked in and mixes almost instantaneo and uniformly around the upward current. It is further assumed that the mass of the asp air is proportional to the height, the proportionality being different for each layer of diffe gradient. Fully symmetrical results are obtained for the temperature and the condensation le as well as for the corresponding gradient. It is evident that the gradient at which the temp ture of the rising air changes is greater than γ_a when the gradient of the surrounding ai $\gamma > \gamma_a$. A method is given for the calculation of the condensation level, which depends not on the temperature stratification but also on that of the humidity. *Subject Heading:* **1. C densation level calculation techniques.**—*Author's abstract.*

Kinematics (551.511.2)

12N–71 551.5

Minegishi, S., **Another expression of the absolute vorticity by linear velocity of Earth's rotation.** *Journal of Meteorological Research,* Tokyo, 8(3):172–174, March **1956.** 17 eqs. In Japanese. **DWB, DLC**—The perpendicular component of the vorticity is expre by the sum of the two phenomena; one is a relative vorticity determined by the base of v velocity, and the other is a curl factor (f), hence the author tried by equation to substitute for linear velocity of the Earth's rotation. This equation was applied to a right angle cu circle curve, and spherical-Polar curve, with a view to obtaining the absolute vorticity. *Sub Headings:* **1. Kinematics 2. Vorticity theories 3. Earth's rotation effects.**—*C.E.W.*

12N–72 551.511.2:551.513.1:5

Panchev, St., **Transformatsiia na kinetichnata energiia na osrednenogo dvizheni kinetichna energiia na turbulentnostta pri statsionerna atmosferna tsirkulatsiia.** [Tr formation of kinetic energy of mean motion into kinetic energy of turbulence during statio atmospheric circulation.] *Khidrologiia i Meteorologiia,* Sofia, No. 3:3–7, **1956.** 3 refs., 3 ta 13 eqs. **DLC**—The mechanism of kinetic energy transformation into turbulent energy is plained mathematically and treated quantitatively in terms of wind components, geographic lati and surface roughness parameter. It is found that around 1% of the solar radiation will pensate for the energy loss due to such energy transformation. *Subject Headings:* **1. Kin energy transformation 2. Turbulent energy.**—*G.T.*

12N–73 551.511.2:551.5

Pokrovskiĭ, G. I., **Atmosfera kak istochnik energii.** [The atmosphere as a source of ene Original Russion (3 p.) in *Sovetskaia Aviatsiia,* No. 224, Sept. 21, **1957.** Transl. into Englis George K. Kudravetz, issued as *U. S. Air Force Air Intelligence Information Report,* IR-117 Feb. 26, **1958.** Photostat copy available for ref. **DWB** (M11 P761at)—General speculatio energies present in the atmosphere which could be converted into aircraft propellants, e.g., energies released during condensation of water vapor or recombination of dissociated molec *Subject Headings:* **1. Energy sources 2. Earth's atmosphere. I. Kudravetz, George** (*transl.*).—*G.T.*

12N–74 551.511.2:551.551.8:551.4

Bezyzvestnykh, A. V., **Reshenie zadachi o teploobmene tranzitnoĭ strui s vodovorotc prudakh-okhladiteliakh.** [Solution of the problem of heat exchange in a transit jet wi vortex in cooling ponds.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy,* No. 61–69, **1959.** 2 figs., 8 refs., 29 eqs. Russian summary p. 69. **DWB**—The problem of the int heat exchange in cooling ponds is solved by means of the theory of turbulent motion of a In the simplest dynamic problem of a uniformly stable open current in the case of large section diameters and absence of cross currents, the relationships between the depth of a poi surface slope I, distribution of longitudinal velocities along the vertical $v_x(y)$, specific weig fluid γ, on the one hand and the dynamic coefficient of vertical viscosity Ay on the other is by an equation. The relationship between coefficient of turbulent diffusion, Dz and Ay and the water temperature in the terminal section of the jet are also expressed by equations. experimental verification of the new calculation method is presented and a satisfactory agree with natural observations was obtained. *Subject Headings:* **1. Heat exchange 2. Turbu motion in fluids.**—*I.L.D.*

12N–75 551.511.2:551.51

Ōta, Morizō (*Kobe Marine Obs.*), **Role of vertical structure of atmospheric circular v in the movement of its center.** *Umi to Sora* (*Sea and Sky*), Tokyo, 35(2/3):27–35,

igs., 4 tables, 6 refs., 34 eqs. In Japanese; English summary p. 27. **DLC**—At the center of ircular vortex, applying the formula of kinematic analysis to the tendency equation of atmos-eric pressure at the Earth's surface, it is readily seen that the movement velocity of a disturbance ter is separated into the components due to advection of air density and horizontal divergence flow in the air column extended semiinfinitely upward. According to estimation of their orders, find that the former is the major portion of the steering and, generally in the case of a mature pical cyclone, the latter is almost negligible. Furthermore, the present paper shows that the ering level is determined by the vertical structure of a circular disturbance. Selecting 5 amples: Palmén's hurricane model, typhoons "Kezia," "Kitty," "Jane," and "Marge," the heights the respective steering levels are computed. It is thus concluded that the role of the vertical ucture of a circular vortex is very important in the steering of the vortex center. *Subject adings:* **1. Circular vortexes 2. Tropical cyclone steering.**—*Author's abstract.*

12N–76 551.551.2:551.558.1:551.576.1

Watanabe, Kazuo (*Met. Res. Inst., Tokyo*), **Hygrokinematical analysis and its application weather forecasting: one proposed method to abridge the cloud physics and synoptics.** *teorological Society of Japan, Journal,* Ser. 2, 37(5):164–169, Oct. **1959.** 49 figs., 18 refs. Japanese; English summary p. 164. **DWB, DLC**—Meteorology of the border area between ud physics and synoptics and a method of combining knowledge of both in weather forecasting ve not been considered so far. Using the idea proposed by LIGDA about the aftereffect of a nderstorm, the author attempted to develop a technique which was named "hygrokinematical alysis" by LIGDA. This technique starts with the assumption that the vertically developed cloud l disintegrate to stratiform clouds of several layers. The cloud will be blown away by the nds at each level, maintaining its cloud form and high liquid water content as long as it con-ues to move upward. The procedure of the analysis used in this paper is explained. Case dies of this technique are made for 6 different storm situations and very satisfactory results e obtained, except in one case which showed big wind shear. These case studies also offered od explanations of the phenomenon of bad weather persisting in a cold air pool and of rain stems near a hurricane. This technique would be most suitable for very short range weather ecasting from 3–5 or 13 hrs ahead. Isentropic trajectories are also constructed and compared h constant pressure level trajectories. *Subject Headings:* **1. Hygrokinematic analysis 2. eather forecasting techniques 3. Cloud trajectories 4. Isentropic analysis.**—*From author's stract.*

DYNAMICS (551.511.3)

12N–77 551.511.3:536.25

Yih, Chia-Shun (*State Univ. of Iowa, Iowa City*), **Free convection due to boundary urces.** *U. S. Office of Naval Research, Proceedings of the 1st Symposium on the use of odels in Geophysical Fluid Dynamics, 1953,* p. 117–133, pub. **1956.** 11 figs., 6 refs., 50 eqs. **VB, DLC** (QC809, F5U5)—Free convection due to (1) a point source of heat, for the laminar, turbulent and the stable case; (2) a line source of heat for the laminar and turbulent case; l (3) two parallel line sources, is treated in theory and on the basis of results obtained in a oratory and by other workers in the field. Conclusions are: 1) For laminar free convection, larger the Prandtl number, the more concentrated are the temperature and velocity distribu-ns. 2) For turbulent free convection, the results apply only to moderate elevations above the ound, especially if stability is not great and boundary source is strong. 3) The effect of thermal oyancy is to concentrate the temperature distribution in relation to the velocity distribution for h turbulent and laminar cases and for both 2-dimensional and axisymmetric flow. Patterns and tribution functions are shown in nomograms and scatter diagrams for each case. No measure-nts were made for the laminar cases. For the turbulent case midget anemometers were used. me from a bunsen burner or a cigarette (smoke) was used for point source of heat. *Subject adings:* **1. Convection theories 2. Point source convection 3. Line source convection Turbulent free convection 5. Laminar free convection.**—*M.R.*

12N-78 551.511.3

Woodbury, Max A., **Probabilistic dynamics.** New York Univ. College of Engineering. search Div. Contract AF 19(604)-3490, (unnumbered report), April 30, **1959.** 7 p. 3 eqs. **VB** (M11.4 N532pro)—THOMPSON and others have concerned themselves with the growth of ertainty of the initial state of the atmosphere with time. Once the uncertainty is recognized, re are several courses open to deal with it. This report is concerned with an avenue of approach ch allows a unified viewpoint based on probabilistic notions rather than on a theory of ap-ximation. It is assumed that: 1) There exists a probability distribution of the initial state the system which summarizes all relevant available information on the state of the atmosphere a given time. 2) There is a "system dynamics," i.e., a set of equations which describes the

behavior of the system, i.e., precisely predicts the behavior of the system, given the initial st of the system. In the systems studied here, a differential equation (generally partial) provi a description of system dynamics. 3) There is a set of observations giving "properties" of system. For example, the temperature at Moline, Ill. at 1330 Z, Jan. 29, 1903, etc. The probl is not considered in its full generality, but instead, the authors are concerned with a more c strained set of objectives relating to the growth of measures of uncertainty about the syst state with time, in the absence of observations (as in forecasting) and later, the effect of obser tion on these same uncertainty measures. In particular, the mean square error of physi properties is considered as a function of space and time. *Subject Headings:* **1. Dynamics atmospheric waves 2. Probability theory.**—*From author's introduction.*

Hydrodynamics (551.511.32)

12N–79 551.511.32:551.

Kivéliovitch, M., **Quelques considérations sur le mouvement géostrophique plan.** [Sc considerations on plane geostrophic movement.] *Journal Scientifique de la Météorologie,* Pa 5(203):165–169, Oct./Dec. 1953. eqs. **DWB**—The author discusses theoretically the continu and intermittent horizontal movement in general, and nondivergent fluid or a fluid with zero t bulence in particular. *Subject Heading:* **1. Geostrophic wind theory.**—*Based on author's abstr*

12N–80 551.511.32:551.543:551.55

Romov, A. I., **Ob osnovnykh faktorakh izmeneniia davleniia i mekhanizme vertikal 'ny dvizhenii.** [Main factors in pressure changes and the mechanism of vertical motion.] *K Ukraine. Ukrainskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy,* No. 70–85, 1956. fig., 23 refs., 18 eqs. **DWB, DLC**—A theoretical paper in which the author devel an equation of the tendency for an individual air layer and uses it in the qualitative analysis main factors of pressure changes and of the mechanism of vertical motion. *Subject Headin* **1. Pressure changes 2. Vertical motion theories.**—*A.M.P.*

12N–81 551.511.32:551.

*Borisenkov, E. P., **O gorizontal'noĭ divergentsii skorosti v atmosfere.** [Horizontal wind sp divergence in the atmosphere.] *Meteorologiia i Gidrologiia,* Leningrad, No. 6:3–7, June 19 2 figs., table, 6 refs., 12 eqs. **DWB, DLC**—If variation of barometric tendency (change of g potential) is computed only from the divergence rather than by comparing equation

$$\frac{\partial p_0}{\partial t} = -\int_0^{p_0} \mathrm{div}_h \, c\,dp,$$

and that of vortical velocity for mean level

$$\frac{\partial H}{\partial t} = -l\frac{9.8}{m}(H_{\Delta},H) - \frac{1}{m}\frac{l^2}{9.8}\left(\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}\right),$$

then in the first case positive divergence causes a pressure fall and in the second case a rise. Si in the former equation barometric tendency is determined directly from the divergence while in latter it is determined from a semiempirical relationship (m is determined empirically) the lac agreement can be explained by assuming that the role of the divergence term is slight in both ec tions. The order of magnitude of divergence should in this case be smaller when it is calcula from the wind field. A computation of the mean velocity divergence by the method of Bjerkn modified by Fujita, and by an indirect method, indicates the existence of a lack of agreement in order of magnitude of velocity divergence determined according to the wind field, and by indi methods (from the equations of continuity and adiabatic conditions). A method of comput divergence, analogous to that of Bjerknes, is examined and it is shown that the role of the diverge term is overestimated in the equations of vortical velocity and the tendency equation cannot be u in practice. The results of calculations of horizontal divergence for the 500 mb level are shown table and plotted on a map. *Subject Headings:* **1. Horizontal divergence calculations 2. W velocity divergence.**—*I.L.D.*

12N–82 551.511.32:551.5

Djurić, D., **O primeni teorije malih poremećaja na difluentnu osnovnu struju.** [On the appl tion of the perturbation theory on the diffluent basic current.] *Belgrade. Univerzitet. Meteorol Zavod, Rasprave,* No. 2:9–16, 1958. 3 figs., 4 refs., 12 eqs. English summary p. 16–17.— Rossby formula $c = u - \beta(L^2/4\pi^2)$ cannot be applied in a barotropic nondivergent atmospheric m where the vorticity equation holds, if the basic motion is not zonal, because the linearization can be performed owing to the value of the basic velocity V. Linearization, however, is justifiable if basic current everywhere has the basic vorticity equal to zero. A diffluent motion field descr

$u=ax$, $V=ay$ for $x<0$ and where $a=$constant, may characterize large parts of some weather rts. The motion of the hyperbolic stream field is examined and theoretically investigated on the umption that the stream function ψ ensures the nondivergence of the solution $u=-\partial\psi/\partial y$, $=\partial\psi/\partial x$; the vorticity equation is solved only at $t=0$ when vorticity $Z=\nabla^2\psi$ and $\nabla(\nabla^2\psi)$ are equal zero; the solution is sought in a region bounded by $y=D$ and $y=-D$, etc. The vorticity equation educed to the form $\partial^2 t/\partial y^2=-a\beta y$ which is solved with $\tau=(1/\delta)a\beta y(D^2-y^2)$ where $\tau=\partial\psi/\partial t$. The ıation for the motion of perturbation in a quasihyperbolic field is the modified Rossby formula $-ax-\beta(L^2/4\pi^2)$ where the basic velocity $-U$ is given by $U=-ax$, $V=az$. *Subject Headings:* **Perturbation theories 2. Diffluent basic current.**—*I.L.D.*

12N–83 551.511.32

Kawai, Hideo (*Tohoku Regional Fisheries Res. Lab., Shiogama*), **The natural coordinates on equiscalar surface undulating with time.** *Oceanographical Society of Japan, Tokyo, Journal,* 4) :127–136, Dec. 1958. fig., 8 refs., 38 eqs. **DWB**—The geometry and kinematics in the ural coordinates on an equiscalar surface undulating with time, are derived from the extended ectional differentiation. The equations of motion and the vorticity equations are represented he frame of the coordinates. The use of the present coordinates permits the analytical deriva- of the dynamical laws in complete form, affording a more natural view in the transformation equations. This also makes numerically insignificant the effects of the undulation of isobaric faces in the equations of motion referred to isobaric surfaces. *Subject Headings:* **1. Equa- ns of motion 2. Vorticity equations**—*I.S.*

12N–84 551.511.32

Berson, F. A. (*C.S.I.R.O., Melbourne*), **On the vorticity theorem.** *Australian Meteorological gazine,* Melbourne, No. 26 :90–95, Sept. 1959. fig., 5 refs., 6 eqs. **DWB**—It is shown that Rossby β term arises from the vortex tube term in the vertical vorticity equation in spherical- ar coordinates. This result, formally due to S. Karelsky, lends itself to a physical interpre- on and a simple graphical representation which are discussed. *Subject Headings:* **1. Vorticity uations 2. Vorticity theorem.**—*Author's abstract.*

12N–85 551.511.32

Gandin, L. S. and Dolod, T., **O sposobakh integrirovaniia uravneniia vikhria vdol' izo- icheskoi poverkhnosti.** [Methods of intergrating the vorticity equation along an isobaric face.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy,* No. 81 :53–57, 1959. le, 6 refs., 11 eqs. **DLC**—The vorticity equation can be used as a unique forecasting equation ecially for a nondivergent level. By means of initial data it is possible to determine from this ation the derivative of vorticity (tendency) with time $(\partial\Omega/\partial t)z$ and, by integrating along izontal coordinates x and y, to pass from vorticity tendency to the geopotential tendency $\partial H/\partial t$. e derivation of the equation is given. The numerical solutions of this equation by P. Fjørtoft, I. Buleev, B. D. Uspenskiĭ, and M. I. Iudin are presented and compared. The accuracy the different methods of solving this equation is presented in a table. The analysis of the ılts led to the following conclusions: 1) The application of the "single point" formulas, i.e., the first approximation of Fjørtoft and the formulas of Buleev and Uspenskiĭ do not yield roper degree of accuracy. 2) The use of a triangular network gives more accurate results n a square network. 3) The formulas of Iudin based on local limiting conditions deserve wide lication. *Subject Headings:* **1. Vorticity equations 2. Forecasting equations.**—*I.L.D.*

12N–86 551.511.32

Vítek, Vojtěch, **Poznámka k rovnici vorticity.** [Note on the vorticity equation.] *Meteoro- ické Zprávy,* Prague, 12(2/3) :59–60, 1959. 11 eqs. **DWB, DLC**—A special form of the ticity equation is derived and briefly discussed. *Subject Heading:* **1. Vorticity equations.**— *thor's abstract.*

Thermodynamics (551.511.33)

12N–87 551.511.33

Rakipova, L. R., **Metod rascheta advektsii tepla pri atmosfernykh makroprotsessakh.** method of calculating heat advection during atmospheric macroprocesses.] *Leningrad. vnaia Geofizicheskaia Observatoriia, Trudy,* No. 66(128) :17–32, 1956. 9 figs., 16 tables, 9 s., 21 eqs. **DWB**—A method for calculating advection is developed; examples of its application presented, and a physical analysis of the results is given. Proceeding from the linearization the equation of heat transport in a spherical coordinate system, the author derives formulas for ermining advective transport in unit time and the variation of the heat content of a column with altitude. The characteristics of heat advection are discussed with the aid of computed a for different points. *Subject Heading:* **1. Advection of heat calculation techniques.**—*I.L.D.*

12N–88 551.558.21:551.511.33:551.513(235

Chu, Pao-chen (*Inst. Meteor. Geophys. Academia Sinica*), **The steady state perturbati of the westerlies by the large-scale heat sources and sinks and Earth's orography, Pt** *Acta Meteorologica Sinica,* Peking, 28(2):122–140, **1957.** 14 figs., 51 refs., 5 eqs. In Chin English summary p. 139–140. Also: **Pt. 2,** *Ibid.,* 28(3):198–224, **1957.** 19 figs., 2 tables, 24 In Chinese; English summary p. 222–224. **DLC**—Equations are derived to find separately effects of topography, heat sources and sinks, as well as the combined influence of the th Flow patterns due, respectively, to the thermal effect and the topographical effect, in addition their combined effect on westerlies, have been constructed. By examining these patterns, con sions have been reached concerning the formation of mean troughs and ridges, and the jet stre *Subject Headings:* **1. Westerly disturbances 2. Large scale exchange 3. Heat sources sinks 4. Upper air pressure distribution.**—*Based on author's abstract.*

12N–89 551.511.33:551.524:551.4 551.573:581.11

†Problema teplovogo i vodnogo rezhima zemnoi poverkhnosti i ee znachenie fizicheskoi geografii. [Problems of the hydrothermal and water regime of the Earth's sur and its importance to physical geography.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.,* 5:77–103, Sept./Oct. **1957.** 31 refs. at end of last article. **DWB—In Obzor nauchn dokladov na koordinatsionnom soveshchanii** [Review of scientific papers at the coordin conference] A. P. Gal'tsov discusses the importance of the relationship of the processes of exchange and moisture exchange, the exchange of energy and matter among complex geogra media, recent Soviet studies on heat balance of the Earth's surface and further problems of balance to be investigated and the investigation of physical indications of wheat and mois exchange of crop yield and plant development. The latter includes the establishment of quant tive relationships between crop yields and evaporation and other weather variables; the flow water to the root zone of the soil, the ascent of suspended water in the soil; evaluation of hydrometeorological conditions during the vegetation period of crops and the relationship betw photosynthesis and respiration and meteorological conditions, etc. Also a general survey is sented of the regulation and redistribution of runoff. This involves the study of the effect forest strips upon water balance, the variations in surface runoff under the influence of cultivation, the role of snow melt in the moisture and heat exchange, process of snow melting forest strips, etc. **Itogi nauchno-issledovatel'skikh rabot po teplovoĭ melioratsii merzl gornykh porod i kholodnykh pochv i zadachi dal'neĭshikh issledovaniĭ** [Results of scien investigations on the heat melioration of frozen rock strata and cold soil, and problems for fur investigation], by P. F. Shvetsov reviews briefly the history of applications which have b made of the principles of heat exchange in the Earth's crust, and of the lithosphere-soil-atmosph system, not only to prevent penetration of frost into deeper layers of the soil, but also to th actually frozen rock strata. Particularly mentioned are the work of P. I. Koloskov and results of studies on the thawing of permanently frozen gold deposits carried out by N. P. Baka and V. G. Gol'dtman. These included the suitability of using natural heat sources such as s radiation and surface water, to melt permafrost strata so that strata 6–8 m thick could be tha without costly engineering expenditures. In **Nekotorye itogi izucheniia mestnykh vod pust** [Some results of investigations of local waters of deserts] V. N. Kunin examines the chem properties of underground waters in deserts, the influence of the geographical characteristics deserts upon the character of underground waters with special reference to the underground wa of the Kara Kum desert. *Subject Headings:* **1. Heat and moisture balance 2. Heat bala of Earth's surface 3. Frost penetration 4. Desert underground water 5. Moisture bala of crops. I. Gerasimov, I. P. II. Gal'tsov, A. P. III. Shvetsov, P. F. IV. Kunin, V.** —*I.L.D.*

12N–90 551.51

Rao, K. N. (*Regional Met. Center, India Met. Dept., Bombay, India*), **Normand's prop tion II.** *Meteorological Society of Japan, Tokyo, 75th Anniversary Vol. of the Journal,* Nov. **1957.** p. 87–91. 3 tables, 6 refs., 14 eqs. **DWB, DLC**—Study of Normand's sec proposition (*see* his **Wet bulb temperatures and the thermodynamics of the air** (*Memoirs Indian Met. Dept., 23,* Pt. 1, **1921**) namely: the entropy of any air approximately equals entropy of the same air saturated at its wet bulb temperature minus the entropy of the liq water required to saturate it. This proposition is approximate. The author works out the form of this approximation (λ) and calculates the limit of its acceptability. Tables give the numer values of the approximation (λ); λ is numerically very small. Tables are given to facili evaluation of entropy of saturated air for $p = 1000$ mb and for temperatures from 273°–317° *Subject Headings:* **1. Thermodynamics of the atmosphere 2. Normand's proposition II.**—*

12N–91 551.511.33:551.515.31 551.508.21

Wisconsin. Univ. Dept. of Meteorology, **Study of differential heating of air columns.** ıtract Cwb-8666, Annual Report, Jan. 31, 1957. [23 p.] figs., refs., eqs. Appendix A, Suomi, E. and Kuhn, P. M.: **An economical net radiometer.** Appendix B, Kuhn, P. M. and Suomi, E., **Airborne observations of albedo with a beam reflector. DWB** (M11 W811s)—A study ıed at the precise assessment of the heat budget involved in local heating, which in turn produces vective activity, and the relation of this heating to tornado incidence in the Midwest. Inci- ıtally, a net radiometer was developed and a study of albedo over various types of terrain in Dak., Iowa and Wis., using an Eppley pyrheliometer mounted on an aircraft, was made and orted on. *Subject Headings:* **1. Heat budget 2. Tornado development 3. Radiometers Midwestern United States.**—*M.R.*

12N–92 551.511.33:551.525:551.524

Budyko, N. I., **Izuchenie teplovogo balansa zemnoi poverkhnosti.** [Study of the heat ance of the Earth's surface.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.,* No. 4:83–86, y/Aug. 1958. At head of article: Lenin prize for the most prominent work in the field of ence and technology (legend in Russian). **DWB**—A brief history of the development of studies ative to solar radiation received by the Earth's surface is given at the beginning of the article. e methods of reduction of observational data are mentioned. Contributions by various investi- ors are outlined and existing studies on the subject are considered. Possibilities for further dies are outlined. *Subject Heading:* **1. Heat balance of Earth's surface.**—*B.J.G.*

12N–93 551.511.33:577.4

Lowry, William P. (*Oregon Forest Lands Res. Center, Corvallis, Oregon*) and Chilcote, lliam W. (*Oregon State College, Corvallis*), **Energy budget approach to the study of micro- vironment.** *Northwest Science,* Cheney, Wash., 32(2):49–56, **1958.** 3 tables, 19 refs. **DLC** The usefulness of Geiger's energy budget $R_n = E + B + L$ (R_n = radiant energy arriving at rth's surface, E = energy used for phase transitions; B = energy absorbed by soil; and L energy released to the air) as an ecological tool is examined. The energy budget is found to a good measure of ecological environment, providing several advantages over other units. oblems of measuring the elements of the energy budget are discussed. *Subject Headings:* **Energy budget equation 2. Ecoclimatology.**—*G.T.*

12N–94 551.511.33

†Hansen, C. Frederick (*Ames Res. Center, Moffett Field, Calif.*), **Approximations for the rmodynamic and transport properties of high-temperature air.** *U. S. National Aeronautics l Space Administration, Technical Report,* R-50, 1959. 35 p. 11 figs., 7 tables, 36 refs. 98 .—Approximations are presented for the thermodynamic and transport properties of high perature air. Compressibility, enthalpy, entropy, the specific heats, the speed of sound, the fficients of viscosity and thermal conductivity, and the Prandtl number for air are tabulated m 500°–15,000° K over a range of pressures from 0.0001–100 atmospheres. *Subject Headings:* **Aerodynamics 2. Supersonic flow 3. Viscous flow 4. Aerodynamic heat transfer 5. w of rarefied gases.**—*Author's abstract.*

12N–95 551.511.33:551.558.1

Krustanov, L. and Iordanov, Dimiter (*both, Inst. f. Hydrology and Met. Sofia*), **Über den irmestrom der freien Konvektion in der Atmosphäre.** [Heat flow of free convection in atmosphere.] *Időjárás,* Budapest, 63(3):120–134, May/June, **1959.** 4 refs., 13 eqs. English mary p. 129; Hungarian summary p. 133–134. **DLC**—As a rule, the two components of the tical atmospheric heat current, i.e. the free thermal convection and the turbulence, function ether. It is of importance to know the quantity of heat transported separately by each of the nponents. The free thermal convection is, to a certain extent, also a turbulent process and nay be assumed that a certain proportional relationship exists between the two components. this basis, both the values of the heat current maintained by the thermal convection and also values of the coefficient of the turbulence aroused by the convection, can be stated. *Subject adings:* **1. Thermal convection 2. Turbulence coefficient.**—*Author's abstract.*

12N–96 551.511.33:551.571.7:536.423

. Kuihara, Y. (*Met. Res. Inst., Tokyo*), **Considerations on the heat and water vapour budgets r the U.S.A. in Jan. 1957.** *Meteorological Society of Japan, Journal,* Ser. 2, 37(6):258–273, c. **1959.** 11 figs., table, 6 refs., 20 eqs. Japanese summary p. 273. **DWB, DLC**—Distribution heat gain or loss in a whole layer from the ground surface to 500 mb level as well as at some cified levels is presented. At most places a heat sink is seen near the ground surface while

heat sources appear at some places in some upper layers. One of the factors of heat gain is heat released by condensation of water vapor, and the region where a large amount of condensat is estimated, coincides well with the region of the heat source. Cooling of an air column bel 500 mb level due to long wave radiation is estimated to be 300 ly/day, or thereabouts. Excha of sensible heat between the ground surface and atmosphere is supposedly smaller than the h gain or loss by the two factors above. Calculation of budget of water vapor shows that net c densation is in excess of observed amount of precipitation in some regions and in deficit in oth In the former regions, weather conditions such as cloudy without precipitation is observed f quently. It seems necessary to study the role of clouds as conveyors of moisture. *Subject He ings:* **1. Heat budget 2. Water vapor transfer 3. United States.**—*Author's abstract.*

12N–97 551.511.33:551.524.4:551.52

Péczely, Győrgy, **Az advektív hőmersékletváltozás folyamata Magyarországon.** [T process of advective temperature changes in Hungary.] *Időjárás,* Budapest, 63(5):274–2 Sept./Oct. **1959.** 4 figs., 3 tables, 2 eqs. Hungarian and German summaries p. 274. **DLC** The connection between the changes in temperature at 3 km below the surface and on the s surface was examined. The connection is less during the winter than during the summer, a there is less possibility of warming up than cooling near the ground. Substantial changes in t temperature near the ground are connected with the macrosynoptic conditions. The vertical e pansion of different types of winter temperature changes are reviewed. The majority of t observations was made 1951–58. *Subject Headings:* **1. Advective temperature changes Hungary.**—*E.K.*

12N–98 551.511.33:551.558.29:551.524.3:551.510.52

Pennsylvania. State Univ. Mineral Industries Experiment Station. Dept. of Meteorolo Contract AF 19(604)-2190, Final Report (in 3 pts.), Dec. **1959.** Pt. 1, Julian, Paul **Tropospheric behavior associated with the Arctic stratospheric warming phenomenon.** 1 p. 41 figs., 2 tables, 31 refs. **Pt. 2,** Epstein, Edward S., **Large scale vertical motion in t stratosphere.** 122 p. 62 figs., 6 tables, bibliog. p. 92–95, numerous eqs. For **Pt. 3,** *see* 12.1 159, Nov. **1961,** *Met. Abs.* **DWB** (M(o51)P415rep Final)—The purpose of Pt. 1 is to sh that the rapid warmings at stratospheric levels are systematic changes in the distribution of pr sure and density, and therefore of the circulation pattern, in the troposphere. In particular, it demonstrated that the collapse or "filling" of the stratospheric Polar vortex is accompanied rising tropospheric and surface pressures. Such simultaneous pressure rises in the stratosph and troposphere are taken to be evidence of a stratospheric-tropospheric coupling. Eight winte 1952–1959, have been investigated in an effort to ascertain tropospheric behavior occurring c currently with the warming phenomenon. A precise definition of the warming phenomenon w formulated by assuming that the transition of the Canadian Arctic stratosphere from a barocli state, with wind speeds at 100 mb, 2–3 times those at 500 mb, to a near barotropic state, w the wind speeds at 100 and 500 mb almost equal, was the systematic, and annually recurring ev of interest. By examining the 100 and 500 mb height differences between an Arctic and a mid latitude station, such a transition was found to occur once in each of the winters, and the date the beginning of the transition was easily determined. The large scale tropospheric behavior w determined by computing pressure change charts from 30-day mean sea level charts ending a commencing on the approximate date at which the stratospheric transition began. In addition, winter course of the 100 mb height, sea level pressure, and the density at 15 km were plotted an Arctic station for each winter, to determine relationships between the pressure at the two lev In each of the eight winters the sea level pressure was observed to increase in the Canadian Ar and decrease in middle latitudes as the transition occurred in the stratosphere. Two winters data from the Antarctic indicated increases in station pressures over the continent, as the Antar stratospheric transition occurred. In Pt. 2, an empirical study is made of the interrelations tween the horizontal flow pattern in the lower stratosphere and the effect of vertical motion the budgets of vorticity and ozone. Two periods in the winter of 1956 are studied. On the ba of the contours of the 200-, 150-, 100-, and 50-mb surfaces, the terms of the vorticity equat are evaluated, and vertical velocities are computed from the adiabatic equation. Changes in t ozone amounts are compared on a synoptic basis with the horizontal and vertical fields of moti The local change of vorticity, vorticity advection, and the divergence term (neglecting the relat vorticity in comparison with the Coriolis parameter) appear to be the only terms of importance the vorticity equation. Divergences computed from this equation, omitting the lesser terms, ag well with divergences calculated from the vertical velocities derived from the adiabatic equati There is broad agreement between the fields of horizontal and vertical motion, subsidence occurr in flow from ridge to trough and ascending motion in flow from trough to ridge. This patte however, is not invariant, and is particularly disturbed in the presence of short wave disturban

nodel is presented to describe the effects of short and long waves on the patterns of vertical ion and divergence. It is hypothesized that the vertical motions due to short waves are severely ped in the stratosphere, whereas the influence of long waves is maintained to great heights. sequently there is no "level of nondivergence" in the stratosphere, but only occasional dis- inuous "surfaces" of nondivergence which are not even approximately horizontal. A situation vhich the changes in total ozone amount were large is selected and studied in terms of the erved and computed fields of motion. It is shown that it is not possible to explain the observed ie changes if one is to accept the hypotheses which are usually made concerning the normal avior of ozone. *Subject Headings:* **1. Stratospheric warming phenomenon 2. Large scale tical motion 3. Ozone content of air-vertical motion relationships 4. Arctic. I. Julian, l R. II. Epstein, Edward S.**—*E.Z.S. and author's abstract.*

12N–99 551.511.33:551.521

Sakali, L. I., **Zavisimost' napriazheniia radiatsionnykh potokov ot stratifikatsii atmosfery.** pendence of the tension of radiational currents on the stratification of the atmosphere.] *Kiev. ainskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy,* No. 18:90–94, **1959.** gs., 2 tables, 3 refs. **DWB**—The tension of radiation flux to a great degree depends upon the sparency of the atmosphere. Transparency is determined by the intensity of turbulent ex- nge, which in turn depends upon atmospheric stratification. There must, consequently, be a tionship between stratification of the atmosphere and intensity of radiation flux. The results actinometric observations by the Odessa Geophysical Observatory for 1950–56 and data of perature and wind soundings of the atmosphere for these years were used as a basis for this y. A discussion of methods employed and results obtained are included. *Subject Headings:* **Stratification of atmosphere—radiation flux relationships 2. Actinometric observations Odessa Geophysical Observatory.**—*M.B.G.*

12N–100 551.511.33:551.521

Yamamoto, Giichi (*Geophysical Inst. Tohoku Univ.*), **Theory of turbulent transfer in non- tral conditions.** *Meteorological Society of Japan, Tokyo, Journal,* Ser. 2, 37(2):60–70, April 9. 6 figs., 5 tables, 10 refs., 44 eqs. Japanese summary p. 70. **DWB, DLC**—The mixing th theory has been extended to cover the nonneutral conditions, and based on it, the expres- s for the velocity profile applicable to conditions of any degree of stability have been derived. as shown that the theoretical profiles agree fairly well with the observed profiles due to RIDER. he same time, comparison with RIDER's observations has revealed some defects of the theory, h seem to be due to neglect of the effects of radiative transfer in the present theory. *Subject dings:* **1. Turbulent transfer theories 2. Radiative transfer.**—*Author's abstract.*

12N–101 551.511.33:551.558.21:551.43(235.24)

Yeh, Tu-cheng, Lo, Szu-wei and Chu, Pao-chen (*all, Inst. of Geophysics & Met., Academia ca*), **The structure of the velocity field and heat balance in the troposphere over Tibet its surroundings.** *Scientia Sinica,* Peking, 8(11):1353–1369, Nov. **1959.** 11 figs., 11 refs. st pub. in Chinese in *Acta Meteorologica Sinica,* 28(2), **1957,** with Romanized title: **Wind cture and heat balance in the lower troposphere over Tibetan Plateau and its surround- ."** **DLC**—The detailed structure of the circulation over the Tibetan Plateau and its vicinity vestigated, utilizing the pibal observations of about 100 stations, obtained during July–Aug. and 1955, and Dec.–Jan. 1955 and 1956. At the same time, sounding data of 1955–56 have used as the basis of a discussion of the heat balance in the troposphere of the same region. concluded that the Plateau exerts a great influence on the structure of the circulation, both nally and mechanically. The Plateau is a heat source in summer. The SE part is still a source in winter, but the rest of the Plateau may be a heat sink. *Subject Headings:* **1. Ver- wind fields 2. Heat balance 3. Orographic effects on circulation 4. Tibetan Plateau, hina.**—*K.C.*

TURBULENCE AND DIFFUSION (551.511.6)

Turbulence

12N–102 551.511.6:551.551(04)

Goldstein, Sydney, **Statistical theory of turbulence.** *Maryland University. Institute for l Dynamics and Applied Mathematics, Lecture series,* No. 6, **1950.** 43 p. (p. 31–38 follow 3), eqs., 25 refs. **DWB**—Notes for a series of 2 lectures on numerous aspects of statistical ulence theory. The first lecture is devoted to work of various authors before World War II, YNOLDS, G. I. TAYLOR, VON KÁRMÁN, PRANDTL), and the second to more recent works. The ionship between empirical and theoretical systems, the spectrum of turbulence, the correlation or, delay of isotropic turbulence, vorticity in isotropic turbulence, skewness in velocity derivi-

tive, spectrum between two resultant wave numbers, Fourier transform, Kolmogorov's theory, similarity spectrum and extensions, three dimensional spectrum and Loĭtsianskiĭ's invariant treated mathematically in various chapters. *Subject Heading:* **1. Statistical theory of turbule I. Pai, S. I.** (*ed.*).—*M.R.*

12N–103 532.52:551.5

Palomares Casado, Manuel, **Estudio teórico de la inestablidad del régimen laminar y tránsito al régimen turbulento en distintos casos de dinámica de flúidos.** [Theoretical s of the instability of the laminar flow and of the transition to turbulent flow in various case fluid dynamics.] *Revista de Geofísica,* Madrid, 13(51/52):259–323, July/Dec. **1954.** 19 20 refs., 5 eqs. **DWB, DLC**—A thorough theoretical treatment of boundary layer problem fluids of small viscosity. The author begins with plane walls and straight uniform pipes, ca lating the diffusion of vorticity and the growth of the boundary layer during the initial ph Then the transition to turbulent flow is discussed, including the effect of slightly divergent c nels, as well as curved channels and pipes. *Subject Headings:* **1. Boundary layer 2. Turbul theories.**—*A.Assur.*

12N–104 551.511.6:551.558:53

Holmboe, Jörgen, **On the evolution of symmetric updrafts in a current with cons shear.** California. Univ. at L. A. Dept. of Meteorology. Contract AF 19(604)-728, I Report, April **1955.** 51 p. 15 figs., 4 refs., numerous eqs.—In a highly mathematical treat the author analyzes the behavior of disturbances in a straight current with constant shear. Couette flow was found to be more unstable for shallow than for deep updrafts. The evol of Kelvin waves is thoroughly discussed and the case of an unbounded updraft is analyzed successful simplification was introduced by representing the disturbances in components horizontal vortex lines and components with horizontal streamlines. The characteristic evol of Queney waves is computed. The Reynolds criterion is derived for systems with axially metric boundaries. *Subject Headings:* **1. Turbulence theories 2. Couette flow 3. K waves 4. Queney waves.**—*A.Assur.*

12N–105 551.511.6:532.

Persen, Lief N. (*Norwegian Inst. of Tech., Trondheim*), **Some remarks on von Kárm equation of isotropic turbulence.** *U. S. National Congress of Applied Mechanics, 2d, Uni Michigan, Ann Arbor, June 1954, Proceedings,* pub. **1955.** p. 667–675. 8 figs., 12 refs., num eqs. **DLC** (*TA5.U52*)—It is shown in this paper that introducing a slightly generalized for the similarity law originally suggested by VON KÁRMÁN makes it possible to deduce expression the rate of decay, the correlation functions and the spectral functions, which have all the features which one expects them to have from information gained by experiments. In add they are not affected by the objections to such an approach made by G. I. TAYLOR in his a **The statistical theory of isotropic turbulence** (*Journal of Aeronautical Science,* 4:311 **1938.**) However, the triple correlation function is proportional to r and not to r^3 for small r, indicating that the range of validity of the proposed approach is rather restricted. *Subject H ings:* **1. Isotropic turbulence 2. von Kármán's constant.**—*Author's abstract.*

12N–106 551.511.6:551.55

Ariel', N. Z., **O vliianii profilia koeffitsienta turbulentnosti na veter v pogranichnom** [Effect of the profile of turbulence coefficient upon the wind in the boundary layer.] *Leni Glavnaia Geofizicheskaia Observatoriia, Trudy,* No. 69:57–64, **1957.** 6 figs., 7 eqs. **DLC**— interrelation between height variation of the turbulence coefficient (k) and the deviation o wind angle near the Earth's surface is formulated by means of a differential equation, and ana for different conditions. The solution of the problem concerning the effect of the coefficien upon the wind velocity is made on the basis of a preliminary assumption that the coefficien is different in the upper and lower layers. Computation of the angular wind deviation altitude is made with reference to the geostrophic winds. The results were plotted on g and parallelograms of wind forces for the analysis and conclusions. *Subject Headings:* **1. ulence coefficient 2. Boundary layers.**—*N.P.S.*

12N–107 551.511.5 or 532

Kliuchnikova, L. A., **Nomogramma dlia rascheta turbulentnykh potokov.** [A nom for calculating turbulent flow.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trud* 69:104–107, **1957.** fig., 2 refs., 2 eqs. **DLC**—Construction of a nomogram for calculation turbulent flow of heat, water vapor and momentum by the diffusion method is described. nomogram is based on Laikhtman's formula for the flow of a substance at a given height. integrated for heights from 1/2–2 m. *Subject Heading:* **1. Turbulent flow nomograms.**—

12N–108 551.551.8:533.6 551.511.6:551.558.1:551.524.4

Inoue, E. (*Nat. Inst. of Agric. Sciences*), **Studies of the shimmering phenomena by heat-(KAGERO) in the atmospheric surface layer, Pt. 1, Turbulent transfer phenomena in the nmering layer.** *Journal of Agricultural Meteorology,* Tokyo, 14(2):41–44, Oct. **1958.** 2 figs., e, 7 refs., 16 eqs. In Japanese; English summary p. 44. Also: **Pt. 2, Turbulent diffusion nomena in the shimmering layer.** *Ibid.,* 15(3):93–96, Jan. **1960.** 2 figs., 11 refs., 14 eqs. apanese; English summary p. 96. **DWB**—In Pt. 1, recent developments by MONIN-OBUKHOV 54) and PRIESTLEY (1957) in the study of natural convective phenomena near a heated surface e been used to obtain the turbulent transport flux equation applicable to phenomena under ex-ıely weak wind conditions during hot days, in which the ordinary aerodynamic method of nating the turbulent transport flux cannot be applied. The "—1/3 power law" for the vertical perature distribution and the "—4/3 power law" for the vertical temperature gradient dis-ıtion have been examined using observations made by the author and by RAMDAS (1953). se laws give an expression of the turbulent transfer coefficient K. The value of K can be ulated by observing the air temperature distribution, and the transport flux is thus calculated he product of K and the gradient of physical quantities concerned. Making use of the data n by RAMDAS (1953) some estimations of K and q, the heat flux, have been carried out. In 2, characteristics of turbulence in the atmospheric surface layer under an extremely unstable lition, in which the shimmering is predominant, are dealt with theoretically. Differences in scale and the lifetime of both shimmering and mechanical eddies are given, and the lifetime shimmering eddy is represented by an equation, which shows that the lifetime increases with ht following the "2/3 power law." The "1/3 power law" of shimmering velocity gives rise he "3/2 power law" of the diffusion height H of smoke, with the downwind distance x from continuous source, making use of the Kazanskii-Monin method (1957) of calculating the ısion height. The rapid increase of diffusion height with distance is proved by an experi-tal result. *Subject Headings:* **1. Turbulent transfer 2. Turbulent diffusion 3. Shimmer-phenomena.**—*Author's abstract.*

12N–109 551.511.6:525.3

Ogura, Y. (*Geophysical Inst., Tokyo Univ.*), **Statistical formulations for a two-dimensional nogeneous turbulence associated with mean velocity having a constant velocity gradient.** *eorological Society of Japan, Tokyo, Journal,* 36(2):41–45, April **1958.** 8 refs., 23 eqs. **'B, DLC**—Presented are analytical formulations for a two-dimensional homogeneous turbulence ciated with mean motion having a constant velocity gradient. The effect of the mean velocity lient and that of the rotation of the Earth on the rate of change with respect to time of the er spectrum of turbulence are shown. *Subject Heading:* **1. Turbulence.** *Author's abstract.*

12N–110 551.511.6:551.521.1:551.524.32

Blinova, E. N., **Mean annual distribution of temperature in the Earth's atmosphere taking account the continents and oceans.** *Canada. Meteorological Branch, Meteorological nslations,* No. 2:5–21, **1959.** 6 figs., 2 tables, 12 refs., 41 eqs. **DWB**—Transl. by A. Nurklik n original Russian, in *Akademiia Nuuk SSSR, Izvestiia, Ser. Geogr. i Geofizich.,* 1(1):3–13, **7.**—The problem of the mean annual distribution of temperature in the atmosphere is solved. iation (long wave and short wave solar radiation) and turbulent transfer of heat (vertical as as horizontal) are taken into account. Calculations for the zonal case are presented and com-d with empirical data. *Subject Headings:* **1. Mean annual temperatures 2. Radiation urbulent transfer of heat. I. Nurklik, A.** (transl.).—*Author's abstract.*

12N–111 551.511.6:532.52

Chou, Pei-yuan (*Peking Univ.*), **Similarity structure of vorticity fluctuation and the theory urbulence.** *Scientia Sinica,* Peking, 8(10):1095–1119, Oct. **1959.** 2 figs., 34 refs., 4 eqs. C—In order to solve the motion of vortices from the equations of turbulent velocity fluctua-, a certain statistical condition has to be introduced into the theory. The author develops this t of view and shows that this statistical condition is the condition of dynamic similarity in l mechanics, namely, the principle of similarity enunciated by PRANDTL in his boundary layer ry of the motion of viscous fluids at high Reynolds numbers. The argument of the similarity orticity structure of the vortices in random motion, composing the turbulent velocity fluctua-, developed in the present paper, leads to the agreement of the distribution of mean velocity of the Reynolds stress, with experiments within definite limits of the flow. The conditions pproximation discussed in the present paper are only estimations of the orders of magnitude he terms concerned. The accuracy of the theory can be improved, if the Reynolds numbers of flows can be further increased. *Subject Headings:* **1. Turbulence theories 2. Vortex motion uids 3. Vortex structure.**—*K.C.*

12N–112 551.511.6:53

Davydov, B. I., **K statisticheskoi dinamike neszhimaemoĭ turbulenentnoĭ zhidkosti.** [St tical dynamics of an incompressible turbulent fluid.] *Akademiia Nauk SSSR, Doklady,* 127(4):7 771, 1959. 3 refs., 11 eqs. **DWB, DLC**—The fact that during large velocities of fluid flow t arises turbulence, i.e., instability of the flow in relation to slight disturbances, renders difficult useless the solution of the hydrodynamic equation for such cases. Hence, it becomes neces to describe statistically the flow of fluids, and a multiplicity of independent currents, occurrin similar or analogous environmental conditions, must be examined. The distribution of probabil of different hydrodynamic magnitudes or corresponding moments, i.e., the mean values of components of the hydrodynamic velocity and their derivatives, characterizes the flow of the fl The fundamental magnitudes describing turbulent flow at each point are considered to be the m velocity and mean pressure; then (single point) second and third moments of pulsating veloci and finally the turbulent dissipation of energy. All the remaining moments entering the equat for these basic magnitudes will be expressed approximately by the fundamental ones. The deve ment of turbulence for large values of Reynolds numbers is examined and a flow bounded by s walls and their characteristic limiting layers with a logarithmic profile of mean velocities are sidered. The equations for the various moments, second, third and fourth, are derived from equation:

$$\frac{\delta u_i}{\delta t} + U_k \frac{\delta u_i}{\delta x_k} + \frac{\delta p}{\delta x_i} - v \frac{\delta^2 u_i}{\delta x^2_k} = 0, \quad \frac{\delta u_k}{\delta x_k} = 0,$$

where u_i = velocity of flow in one of the currents of the multiplicity examined; p = pressure; v = cosity of the fluid. The density of the incompressible fluid is taken as unity. *Subject Headi* **1. Turbulent flow of liquids 2. Statistical theory of turbulence.**—*I.L.D.*

12N–113 551.511.6:551.551:53

Davydov, B. I., **K statisticheskoĭ teorii turbulentnosti.** [Statistical theory of turbulence.] *demiia Nauk SSSR, Doklady,* 127(5):980–982, **1959.** 3 refs., 12 eqs. **DWB, DLC**—Earlier e tions developed by the author (*Akademiia Nauk SSSR, Doklady,* 127(4):768–771, **1959.** abstract, *see* preceding item) are applied to a turbulent boundary layer at rigid walls. The so of turbulence is the boundary layer and it determines the entire turbulence structure. From equations of the earlier study, the equation for the turbulent boundary layer is derived, namely

$$(QS_y)' + (2-\gamma)QR_{xy}U'_x + 2Q^2 = 0.$$

This equation yields a logarithmic profile of mean velocities. A complete system of differe equations for the unknown functions U_i, P, Rij, $Sijk$ and Q is presented. Insofar as boun conditions are concerned, for currents bounded by rigid walls the entire current can be divided a turbulent region and a laminary zone adjacent to the wall. The condition of union of these regions is the continuity of U_i and $\partial U_i/\delta x_i$. *Subject Headings:* **1. Statistical theory of turbul 2. Turbulent boundary layer.**—*I.L.D.*

12N–114 551.511.6:551.552(5-

Hsieh, Yi-ping and Wang, Yao-sen (*both, Inst. of Met., Peking Univ.*), **Some comp tional results of austausch coefficients over Eastern Asia.** *Science Record,* Peking, 3(2):92 1959. 3 figs., 5 eqs., 7 refs. **DLC** (Orientalia)—Using the data of July 5–8, 1956, an att is made to compute the austausch coefficient by means of simplified equations of motion and w transport, and its distribution in connection with the structure and the development of syn systems is discussed. The use of equations in the computation of mean values of the austa coefficient is illustrated in the case of a cold trough passing through North China. The aut conclude that the assumed distribution of the austausch coefficient is correct, if the calcul wind distribution is the same as the observed wind field. *Subject Headings:* **1. Austausch efficient 2. Eastern Asia.**—*K.C.*

12N–115 551.511.6:551.556.2:533

Inoue, E. (*Div. of Met., Nat. Inst. of Agric. Sciences*), **On the model experiments in tunnel of atmospheric phenomena accompanied with effects of the thermal stratifica** *Journal of Agricultural Meteorology,* Tokyo, 15(2):41–45, Oct. **1959.** 10 refs., numerous In Japanese; English summary p. 5. **DWB**—Several methods of applying theoretical consi tions to the model experiments of stack meteorology and to the windbreak problems in a str stabilized surface layer during cold winter nights when the frost damage to vegetation is a break out, are proposed. *Subject Headings:* **1. Turbulence structure 2. Wind tunnel ex ments 3. Stack meteorology 4. Windbreak problems.**—*From author's summary.*

12N–116 551.511.6

Jain, P. C. (*Hindu College, Delhi Univ.*), **A theory of homogeneous isotropic turbulence.** *lied Scientific Research, Ser. A*, The Hague, Vol. 8, Pub. **1959.** p. 219–227. 10 refs., 49 eqs. **/B, DLC** (*TA1.A665*)—Homogeneous and isotropic turbulence has been discussed in the present er. An attempt has been made to find the simplifying hypothesis for connecting the higher er correlation tensor with the lower ones. Starting from the Navier-Stokes equations of motion an incompressible fluid and following the usual method of taking the averages, a differential ation in Q and X, the defining scalar of the second order correlation tensor Q_{ij} and the defin- scalar of a third order isotropic tensor X_{ijk}, has been derived. The tensor X_{ijk} stands for a orial expression containing the derivatives of the third and the fourth order tensors. Then hypothesis is used that $X = F(Q)$, where F is an unknown function. To find the forms of Kolmogoroff's similarity principles have been used, and thus two forms for $F(Q)$ corresponding wo regions of the validity of these principles have been deduced. *Subject Heading:* **1. Iso- ic turbulence theories.**—*Author's summary.*

12N–117 551.511.6:551.551.8

Malkus, W. V. R., (*Woods Hole Oceanog. Inst., Mass.*), **Horizontal diffusion due to turbulent vection. [Extended summary only.]** *Advances in Geophysics*, N. Y., Vol. 6, pub. **1959.** p. 313– fig., 5 refs., eqs. **DWB, DLC**—The author outlines, briefly, past work on a theory of turbulent vection which leads to a quantitative heat transport spectrum without the introduction of irical parameters. "For a large Prandtl number v/k, this theory permits a quantitative estimate he velocity spectrum. When the number v/D, where D is the molecular diffusion coefficient, is large, this velocity spectrum leads to dispersion law $\bar{X}^2 = c(tk\lambda^3)$, where λ is the Rayleigh number c is of order unity." The theory of turbulent motion is based upon two physical assumptions ut the statistically steady solution of the equations of motion: 1) The mean fields of temperature velocity can approach, but never exceed, the conditions for marginal stability of a fluid with no osity. 2) The smallest scale of motion which contributes to the transport of heat is that scale of ion which is marginally stable on the mean field. The "logical" steps in the solution of the blem are outlined. *Subject Headings:* **1. Turbulent convection 2. Heat transport spectrum quations of motion.**—*I.L.D.*

12N–118 551.511.6:551.551:533.15

Mamakin, V. N., **O zavisimosti chisla Richardsona ot vysoty.** [The dependence of the ardson number upon height.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:29–30, July . fig., 4 refs. **DWB, DLC**—The development of turbulence in the atmosphere is evaluated he Richardson number (R_i) expressed by average temperature, adiabatic and actual vertical perature gradients and vertical gradient of wind factor. This expression indicates the con- rable effect of temperature of stratification and nonuniformity of horizontal movement on the lopment of turbulence in the atmosphere. Analysis of results of 120 radiosonde balloon sound- in 1957–58 and computation of turbulence using the Ri method, indicate that the average acteristics up to the altitude of 24 km were in good agreement with the average height of the opause ($H_{avg} = 11.3$ km). In conclusion, the author states that in spite of considerable errors bservations on standard changes in temperature and wind, the results are significant. *Subject dings:* **1. Richardson number 2. Atmospheric turbulence.**—*N.P.S.*

12N–119 551.511.6:551.510.52

Medzhitov, R. M., **Srednie znacheniia chisla Richardsona v nizhnem piatikilometrovom sloe odnoĭ atmosfery nad Minskom.** [Mean values of the Richardson number in the lower 5 km of atmosphere over Minsk.] *Minsk. Gidrometeorologicheskaia Observatoriia, Sbornik Rabot*, No. 12, **1959.** fig., 4 tables, 4 refs., eqs. **DWB, DLC**—Using extensive material of radiosonde nts and simultaneous pibal and radio pibal observations, an attempt was made to calculate the es of the Ri number for the lower troposphere over Minsk. Ri was computed by calculating the e of the vertical gradient of atmospheric temperature and the vertical gradient wind vector for eparately for all temperature-wind atmospheric soundings. The module difference of wind ors for altitude levels was computed on the Molchanov circle in the same manner as thermal ls are calculated. The Ri values were computed for values of γ and γ_a with the aid of a special h. Values of Ri, calculated on the assumption that the coefficients of thermal exchange A_T of exchange of motion A_v are equal, yielded Ri values of 1–13. The Ri values showed an annual diurnal variation. Since according to the mixing theory of Prandtl-Taylor-Richardson the icients A_T and A_v cannot be assumed equal, if over a long period the increase of turbulent gy in the free atmosphere equals zero, then:

$$\mathrm{Ri} = \frac{A_T}{A_v} \frac{(g/T)(\gamma_a - \gamma)}{(\Delta V/\Delta H)^2}.$$

It is shown that

$$(\mathrm{Ri})_{\mathrm{crit}} = A_g/A_T.$$

The results of computations of the mean value of Ri in the free atmosphere over Minsk on the sumption that $A_T = A_g$, and the frequency (%) of cases satisfying the condition $(\mathrm{Ri})_{\mathrm{concr}} < (\mathrm{Ri}$ are presented in tables. The mean annual value of Ri obtained from 3500 ascents of radioson pibals, etc., varied with height from 1–13. The lowest value was observed in the atmospheric la near the Earth's surface and the greatest values at the 2–3 km level. The distribution of Ri va showed a marked annual and diurnal variation. The forecasting possibility of the Ri numbe limited. *Subject Headings:* **1. Richardson's number in the lower atmosphere 2. Radiosonde asce 3. Minsk, U.S.S.R.**—*I.L.D.*

12N–120 551.5

Obukhov, A. M. (*Academy of Science, Moscow*), **Description of turbulence in terms of Lagran variables.** *Advances in Geophysics*, N. Y., Vol. 6, pub. **1959.** p. 113–116. 2 figs., eqs. **DV DLC**—The method of describing turbulence in terms of Lagrangian variables involves giving tistical characteristics of the state of an "indicator" system (an indicator is a selected particle flow termed also "a floating guard"). Consideration of the statistical characteristics of the t of a single indicator may yield valuable information on the properties of flow in the form of a tribution function $\varphi(x,v)$, in particular, all one-point characteristics of turbulence (mean flux velo at any point, Reynolds stress etc.). The conditional distribution function $\varphi_\tau(x,v)$ which is principal characteristic of motion in Lagrangian variables is determined theoretically for " turbulence" when the following are assumed; 1) The evolution of the state of the selected par forms a Markov process and can be described by the Fokker-Planck equation in the space (2) The equations describing the process of a particle floating in the turbulent flow are invariant respect to Galileo's transformations, including translations and rotations. The distribution func φ obeys the equation

$$\delta\varphi/\delta t = -(v\nabla)\varphi + B\Delta_v\varphi$$

and its solution gives the function $\varphi_\tau(x,v)$, the explicit expressions for $\Delta_\tau v^2$, $\delta x^2 = (\Delta x - v_0\Delta t)^2$ and the diffusion coefficient K determined by $K = \frac{1}{2}\frac{d}{dt}\overline{(\delta x^2)}$. *Subject Heading:* **1. Turbulence theorie** *I.L.D.*

12N–121 551.511.6:551.5

Ohji, Michio, **On the theory of homogeneous axisymmetric turbulence, Pt. 3.** *Fuku Japan, Kyushu University, Research Institute for Applied Mechanics, Reports,* 7(28):259– **1959.** 5 figs., 8 refs., 7 eqs. For abstract of Pt. 1, *see* 12.2-282, Feb. 1961, *Met. Abs.*—In major part of this paper, the large scale structure and the final period of decaying homogen axisymmetric turbulence are considered according to Batchelor-Proudman's general theory, outline of which is also reproduced. The essential result is that four independent param appear in the relevant energy spectrum tensor, while the customary theory requires only parameters. Correspondingly, a little modification is found to be necessary for CHANDRASEKH picture of axisymmetric turbulence in the final period, and some illustrative correlation cu in that period are newly computed. In the remaining part, on the other hand, we consid certain special case of axisymmetric turbulence in connection with an interesting model prop by CHANDRASEKHAR which may be regarded as a noninteracting superposition of isotropic axisymmetric fields of turbulence. *Subject Headings:* **1. Turbulence theories 2. Turbul structure 3. Axisymmetric turbulence.**—*Author's abstract.*

12N–122 551.511.6:55

Panofsky, H. A. (*Penn. State Univ.*), **On the structure of turbulence in electrically neu hydrostatically stable layers.** [Summary only]. *Journal of Geophysical Research,* Wash., D 64(12):2195, Dec. **1959. DLC**—Stable layers can be characterized by a whole spectrum of quasihorizontal eddies which can be produced by the large scale variations of mean wind i horizontal. It is likely that these eddies eventually decay into small, isotropic eddies, bu range of wave numbers within any inertial subrange is presumably small. *Subject Head* **1. Turbulence structure 2. Eddy transfer theories.**—*Author's summary.*

12N–123 551.511.6:551.5

Pasquill, F. (*Met. Off. and Chem. Defence Exp. Establ., Porton, England*), **Some cu work on turbulence in the first few thousand feet above ground.** [Extended summary o *Advances in Geophysics,* N. Y., Vol. 6, pub. **1959.** p. 71–73. 5 refs. **DWB, DLC**—The instrument used in the study of atmospheric turbulence at the Chemical Defence Experi

tablishment (Porton, England) is the conventional light weight vane which controls the position the sliding contact of a low friction potentiometer and so provides an output voltage proportional to the deviation of the vane from the horizontal or from some chosen direction. The multaneous operation of 3 balloon-borne instruments up to a maximum of 7000 ft has yielded number of records showing the form of the vertical motion in various conditions. Power spectra er the range of 0.5–10 cycles/min evaluated from the records showed a rapid decrease in intenwith increasing frequency. There was a general tendency for the u and w components to equal at the high frequencies but for the u component to be somewhat higher at low frequency. ie results suggested that at 2000 ft conditions approximating to isotropy might be expected to ist at least over the higher part of the above frequency range but that over the lower part of range anisotropic features might be expected. The dependence of the observed properties of rbulence upon sampling time for which the motion was examined and the effective time over ich the turbulent fluctuations were averaged, are discussed. *Subject Headings:* **1. Atmospheric rbulence 2. Turbulent motion 3. Porton, England.**—*I.L.D.*

12N–124 551.511.6:551.551:532.517.4

Pearson, J. R. A. (*Imperial Chem. Indust. Ltd., Akers Res. Labs., Welwyn, Herts*), **The fect of uniform distortion on weak homogeneous turbulence.** *Journal of Fluid Mechanics,* Y., 5(2):274–288, Feb. **1959.** 5 figs., 9 refs., numerous eqs. **DWB**—The behavior of weak mogeneous turbulence subjected to a uniform distortion is studied by means of linearized equaons that include the effect of inertial interaction between the mean flow and the turbulent fluctuans and of viscous dissipation. Three particular cases of distortion are investigated in varying grees of detail; those of uniform rotation, uniform shear, and uniform irrotational distortion. r the first two, the total energy associated with the turbulence is found to decay, but for the rd it is found in general to increase without limit. A general solution in terms of the spectrum nctions for the restricted case of irrotational distortions is given, particular consideration being id to the asymptotic limits approached as the distortions (not necessarily the rates of distortion) come large. These show that for an arbitrary initial turbulent spectrum the asymptotic rates growth are functions of the precise geometrical nature of the distortion, of an integral parameter the initial spectrum function, of a Reynolds number based on the rate of distortion and the gth scale of the initial turbulence, and of the contraction. A particular example, that of initially otropic turbulence in its final period of decay subjected to an axisymmetric distortion, is worked t in detail and the solution (described in terms of mean turbulent intensities) displayed graphilly for several values of the Reynolds number. *Subject Heading:* **1. Homogeneous turbulence.** *Author's abstract.*

12N–125 551.511.6:551.551.2

Sakagami, J.; Mochizuki, Masako; Ishige, M. et al. *all, Ochanomizu Univ., Tokyo*), **On the ructure of the small-scale atmospheric turbulence near the ground.** *Meteorological Society Japan, Journal,* Ser. 2, 37(5):160–163, Oct. **1959.** 6 figs., 5 refs. **DWB, DLC**—Using a hot re anemometer with a very small time constant and a cathode ray oscillograph, the wind speed every 1/400 sec was observed, from which the autocorrelation and the power spectra were lculated. The results of the theory of local isotropy do not seem to be applicable to the present servation. *Subject Heading:* **1. Microturbulence near the ground.**—*Author's abstract*

12N–126 551.511.6:551.551

Shimanuki, Atsushi (*Geophys. Inst., Tohoku Univ.*), **On the probability distribution of the to-correlation function in atmospheric turbulence.** *Tohoku Univ., Science Reports, 5th Ser., ophysics,* 11(2):132–147, Sept. **1959.** 5 figs., 3 refs., numerous eqs. **DWB, DLC**—It is ted that the existence of the systemic differences of the velocity correlation functions due to teorological conditions should not be discussed without consideration of their statistical errors. the present paper, the probability distribution of the autocorrelation function obtained from the locity fluctuation within a finite time interval is calculated for a model fluctuation. *Subject adings:* **1. Turbulence correlation functions 2. Autocorrelation function.**—*Author's abstract.*

12N–127 551.511.6:551.551

Zavarina, M. V., **Opredelenie kriticheskikh znacheniĭ chisla Richardsona kak kriteriia povyshenĭ turbulentnosti atmosfery.** [Determination of the critical Richardson's number as a criterion increased atmospheric turbulence.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy,* 81:85–91, **1959.** 2 figs., 2 tables, 4 refs., 3 eqs. **DLC**—On the basis of parallel sounding of the nosphere (radiosonde and airplane) for different points in the U.S.S.R., the author attempted to termine the critical value of the Richardson number, i.e. the limit of Ri below which atmospheric rbulence producing bumpiness arises. If the sounding by the two methods is not simultaneous t over an interval of time equal to an hr, the Richardson number can be computed from radiosonde

data for layers sounded by the airplane only up to a height of 5–6 km. The computation of t variation of wind velocity with height for layers less than 1 km has no sense, since the necessa accuracy for the meteorological elements in the formula $\mathrm{Ri} = \frac{g}{T}\frac{\gamma_a - \gamma}{(\overrightarrow{\Delta V}/\Delta Z)^2}$ is unattainable. Verti atmospheric temperature gradients were computed for thinner atmospheric layers so that γ w taken for a layer less than 1 km. The velocity and direction of wind at standard heights of 1 k intervals, were described on the basis of radiosonde data and the maximum temperature gradients the same layers by means of airplane data. The layer with bumpiness was determined from aircr data. The mean vector difference of wind velocity ($\overrightarrow{\Delta V}$) for each km layer was computed fr $\overrightarrow{\Delta V} = (V_1 - V_2)^2 + (\bar{V}\Delta d)^2$ when the variation of wind with height (Δd) was no greater than 15°. was not calculated but the position of a point on a plane within the system of coordinates V a $\overrightarrow{\Delta V}/\Delta Z$ for each km layer of the atmosphere was determined. By means of the formula for Ri the were constructed curves for Ri which served as a demarcation line of the points. The relationsh of various Ri values to bumpiness and the verification of Ri are discussed. *Subject Headin* **1. Atmospheric turbulence 2. Richardson's number.**—*I.L.D.*

Diffusion

12N–128 551.511.6:551.515.

Tseĭtin, G. Kh., **K voprosu ob uchete gorizontal'noĭ diffuzii pri transformatsii vozdushn massy.** [Computation of horizontal diffusion during transformation of air masses.] *Leningra Glavnai Geofizicheskaia Observatoriia, Trudy,* No. 60(122):3–22, **1956.** fig., 6 tables, 7 refs., eqs. **DWB**—The author attempts a general solution of the problem of the transformation of air mass, in a semiplane, using certain simplifying assumptions, and taking into consideration ho zontal diffusion. Equations are derived for 1) the general solution, and 2) the transformati of an air mass over a strip. A sample application, using specific numerical values, is included equation 2. *Subject Headings:* **1. Air mass transformation 2. Horizontal diffusion comput tions.**—*B.J.G.*

12N–129 551.511.6:551.510.42:551.5

Prophet, David T. (*Weather Engineers, Inc., Municipal Airport, Sacramento, Calif.*), **method of estimating vertical gaseous diffusion from wind speed profile data and its applic tion to dosage area prediction.** *U. S. Dugway Proving Ground, Technical Report,* DPGR 20 Dec. **1957.** 78 p. 4 figs., 18 tables, 14 refs., 12 eqs. "Study written in 1955."—The U. S. Arm Chemical Corps Cloud Physics Program reports in this booklet on means of determining t behavior of gaseous and aerosol clouds in the atmosphere. Included are statistical studies on t linear and hyperbolic relationships, multiple correlation coefficients, and the linear regression equ tions and predicted dosage areas. A final conclusion on air temperature is delayed until furth study. *Subject Headings:* **1. Diffusion of gases 2. Vertical diffusion 3. Atmospheric poll tion forecasting.**—*N.N.*

12N–130 551.511.6:551.55

Arrago, L. R., **O metode resheniia uravneniia diffuzii v atmosfere.** [A method of solvi equations of diffusion in the atmosphere.] *Leningrad. Glavnaia Geofizicheskaia Observatori Trudy,* No. 76:120–126, **1958.** 3 tables, 10 refs., 34 eqs. **DWB**—In the case of a stationary probl with the axis x directed along the mean wind velocity, the equation for the transport of water vap in the atmosphere after introduction of nondimensional moisture according to the formula $q = \bar{q}$ is written as

$$U\frac{\partial q}{\partial x} + W\frac{\partial q}{\partial x} = \frac{\partial}{\partial z}K\frac{\partial q}{\partial z},$$

where $\bar{q}$ = absolute humidity, q_0 = atmospheric moisture at the surface of the earth, U, W = veloc components, and K = coefficient of exchange. A method is presented for solving this equation for depending upon the coordinates. The method is investigated for a simpler equation:

$$\frac{U\partial q}{\partial x} = \frac{\delta}{\delta z}K\frac{\partial q}{\partial z},$$

and the solution obtained is applicable only to the ground layer of the atmosphere. The asympto method, the network method and the method of quasistationary sublayers for solving this equati are presented. The results computed by these methods show that the moisture values comput by the network method lie between the values obtained by the other methods, and that those o tained by the asymptotic method agree fairly well with those from the network method. If Δq is small, the asymptotic solution and the solution by the method of quasistationary sublayers a

ose to accuracy. The relative difference between asymptotic and quasistationary methods is quite rge near the beginning of the coordinates. With increase in distance, and decrease in height, these fferences diminish. *Subject Headings:* **1. Diffusion equations 2. Atmospheric diffusion calcula-ons.**—*I.L.D.*

12N–131 551.511.6:551.551.8:551.510.42:546.79

Barad, Morton L. (*GRD, AF Camb. Res. Center, Mass.*), **An analysis of diffusion measure-ents.** *Air Pollution Control Association, Proceedings,* Vol. 50, 1957. Issued **1958?** Paper No. 5 [4 p.], 8 figs., 7 eqs. **DWB** (M10.42 A298ap)—Experiments on diffusion conducted at Round ill, South Dartmouth, Mass. in 1954 and 1955, by a team of meteorologists from Massachusetts stitute of Technology, are described. Tracer elements were emitted 1 ft above grass covered ound at rates varying from 5 to 10 g/sec and concentrations were determined at 183 sampler sitions placed in 3 semicircular arcs of 50, 100 and 100 m radius, 2 mi above ground. Empirical rmulas are developed expressing tracer element concentrations in terms of Polar coordinates d the standard deviation of the wind direction. *Subject Headings:* **1. Diffusion of gases 2. race elements in atmosphere 3. South Dartmouth, Mass.**—*G.T.*

12N–132 551.511.6:551.510.52:551.510.41/2

Cramer, H. E.; Record, F. A. and Vaughan, H. C., **The study of the diffusion of gases or rosols in the lower atmosphere.** Massachusetts Institute of Technology, Dept. of Meteorology, ontract AF19(604)-1058, Final Report, May 15, **1958.** 70 p. 40 figs. (incl. photos), 12 tables, refs., 12 eqs. **DWB** (M10.4 M414st). Also issued as *U. S. Air Force. Cambridge Research enter. Technical Report,* 58-239, **DLC**—The principal objectives of the research described in is report were to achieve improved understanding of the basic physical processes involved in the spersal of air-borne material in the lower atmosphere; and to establish empirical relationships etween basic diffusion parameters and direct meteorological indicators that permit satisfactory uantitative estimates of dispersal from continuous point sources, over travel distances of the rder of 1 km, in a wide variety of general weather conditions. These objectives were achieved rgely as the result of a series of comprehensive field observations involving simultaneous measure-ents both of diffusion and the structure of atmospheric turbulence. The diffusion measurements mprise 10-min average concentrations of sulfur dioxide gas emitted from a continuous point urce near ground level, at travel distance from 50–800 m from the release point for the tracer. he meteorological observations include mean wind speeds, frequency distribution of azimuth wind rection, vertical profiles of wind speed and air temperature, and measurements of the fluctuations wind velocity obtained from bivanes and heated thermocouple anemometers. Over 100 individ-al experiments of this type were carried out at Round Hill and at a field site near O'Neill, Neb. uring Project Prairie Grass, an extensive series of diffusion measurements sponsored by the Air orce Cambridge Research Center during the summer of 1956. These data comprise the most mprehensive set of small scale diffusion and meteorological observations currently available. hey provide a fairly complete picture of the probable variations in basic diffusion parameters er travel distances of the order of 1 km in all conditions of thermal stratification. *Subject eadings:* **1. Aerosol diffusion near the ground 2. Diffusion of gases. I. Houghton, H. G.** *-From author's abstract.*

12N–133 551.511.6:551.551.8:551:510.42

*Cramer, H. E.; Record, F. A. and Vaughan, H. C., **The study of the diffusion of gases or rosols in the lower atmosphere.** Mass. Institute of Technology. Dept. of Meteorology, Con-act AF 19(604)-3460, Final Report, Jan. 15, **1959.** 33 p. 23 figs. (incl. photos), 5 tables, 13 fs. **DWB**—This report deals with two aspects of the research program initiated under the receding Air Force contract (AF 19(604)-1058, *see* 12N–132 above) that had not been brought a stage of completion. The first section of this report deals with 14 diffusion experiments, which ere performed to obtain comprehensive information on the structure of gas plumes from a con-nuous point source located near ground level, over travel distances of the order of 1 km, for mpling times of the order of 1 sec. Meteorological observations obtained in connection with ese experiments include: mean wind speeds and frequency distributions of azimuth wind direc-on.; vertical profiles of mean wind speed and air temperature; and measurements of the fluctua-ons in wind velocity indicated by lightweight bivanes equipped with heated-thermocouple anemome-rs. Analysis of the diffusion data provides valuable insight into the characteristic features of e "instantaneous" plume structure associated with continuous effluent emission from a point urce. Complete summaries of the raw experimental data for the diffusion measurements and the ow-response meteorological observations are presented. The second section of this report pro-des a complete account of the development of an automatic data handling and data collection stem designed to facilitate the rapid sampling of meteorological parameters and the presentation

of results in convenient form. *Subject Headings:* **1. Aerosol diffusion near the ground Diffusion of gases.**—*From author's abstract.*

12N–134 551.511.6:551.510

Cramer, H. E., **Engineering estimates of atmospheric capacity.** *American Industrial H giene Association, Journal,* 20(3):183–189, June 1959. 9 figs., table, 15 refs., 9 eqs. **DLC.** A issued in: Massachusetts Institute of Technology, Dept. of Meteorology, Contract AF 19(60 3460, 1959. 14 p. 9 figs., table, 15 refs., 9 eqs.—From a purely pragmatic viewpoint, sou control and abatement techniques must be employed to reduce contaminant emission to levels t can be safely handled by the atmosphere. Efficient use of this natural waste disposal syst depends upon reliable estimates of atmospheric dispersal capacity which varies widely in both sp and time. Predictions of effluent dilution based on formulas previously available have lacked degree of precision necessary for effective engineering treatment of the atmospheric waste dispo problems of industry. Recent empirical investigations have significantly increased the fun mental knowledge of small scale dispersal mechanisms. These studies provide, for the first tir a comprehensive picture of the variations in basic diffusion parameters in all thermal stratificatio In addition, analyses of these data have led to a new technique for estimating the dispersal air-borne contaminants based on the use of direct meteorological indicators. Estimates obtai by this method are believed sufficiently accurate to provide a basis for resolving many industr air pollution problems. The purpose of this paper is to summarize these recent developments air pollution meteorology and describe their use in obtaining comprehensive estimates of atm pheric dispersal capacity for small scale processes. *Subject Headings:* **1. Atmospheric polluti meteorology 2. Atmospheric diffusion**—*From author's introduction.*

12N–135 551.511.6:551.552:551.482:532

Hosoyamada, Kenzo (*Yamaguti Univ., Japan*), **Studies on the reclaimed land dike from t standpoint of agricultural engineering, Pt. 2, The experiments on the turbulent diffusi coefficient of the air flow and the surface water flow through a long channel.** *Yamagu Japan. University. Faculty of Agriculture, Bulletin,* No. 10:1273–1282, 1959. 3 figs., 2 tabl 4 photos, 4 refs. In Japanese; English summary p. 1282. (For abstract of Pt. 1, *see* 13.3–4 Mar. 1962, *Met. Abs.*) **DLC**—In order to investigate the turbulent diffusion coefficient, the auth used smoke tubes and ink in his experiments, and developed an equation. Results obtained means of this equation are given. *Subject Heading:* **1. Turbulent diffusion investigation.**—*K*

12N–136 551.51

Kauman, W. G., **Aspects of the phenomenological theory of diffusion.** *Académie Roy de Belgique, Brussels, Classe des Sciences, Bulletin,* Ser. 5, 45(1):108–115, **1959.** 6 refs., e **DLC**—Two phenomenological diffusion theories based, respectively, on the thermodynamics irreversible processes, and on a dynamical method, are compared. It is shown that both formu tions correctly describe the diffusion process, and that the selection of the appropriate scheme a particular problem is a matter of convenience. The formulation according to irreversi thermodynamics appears, however, preferable for problems involving the differential diffus equation. The matrix of coefficients connecting the two formulations is calculated explicitly in form applicable to all reference frames for the bulk velocity. *Subject Heading:* **1. Diffusi theories.**—*A.V.*

12N–137 551.511.6:551.510

Pollak, L. W., and Metnieks, A. L. (*both, Dublin Inst. for Advanced Studies, Ireland*), **T influence of air-flow on the determination of the diffusion coefficient of heterogeneous ae sols by the dynamic method.** *Geofisica Pura e Applicata,* Milan, 44:224–232, Sept./Dec. 19 6 tables, 4 refs., 8 eqs. German and English summary p. 224. **DLC**—The influence of hete geneity on the determination of the diffusion coefficient by the dynamic method is investigated polydisperse aerosols with various Gaussian particle size distributions. It is further sho theoretically and experimentally, that the misapplication of Gormley's formula to polydispe aerosols must give different apparent diffusion coefficients when they are determined with the sa air flow by two batteries having different dimensions and numbers of channels. On the oth hand, the apparent diffusion coefficients as measured by two diffusion batteries with different c stants can be equalized by selecting the air flows through the batteries so that $(a/3.77\ bLc)$ for the two batteries is constant where a, b, L are the dimensions of the channels, c their numb and Q the air flow. The dependence of the apparent diffusion coefficient on air flow was tes in a new experimental set up with reduced length of connecting tubing of antistatic rubber. T results of these experiments confirm previous findings. *Subject Headings:* **1. Diffusion coe cients 2. Aerosol diffusion.**—*Authors' summary.*

12N–138 551.511.6:551.551.2

Saïssac, J., **Diffusion par turbulence dans la couche limite du sol.** [Diffusion through bulence in the boundary layer of the soil.] *La Météorologie,* Paris, Ser. 4, No. 56:315–320, t./Dec. **1959.** 10 refs. French, English and Spanish summaries. **DWB**—Meteorology frently employs those methods of fluid mechanics which are based on physical determinism. In same way, statistical methods are used in solving some problems of atmospheric turbulence. ce the present study is limited to a consideration of phenomena in the boundary layer, the ularities of turbulence and diffusion by turbulence which are discussed, are those which are erved up to 1500 m. *Subject Headings:* **1. Atmospheric diffusion 2. Frictional layers 3. rbulence.**—*Author's summary.*

12N–139 551.511.6:551.551.8

Sakagami, Jiro and Mochizuki, Masako (*both, Ochanomizu Univ., Tokyo*), **Some considerans on the mechanism of atmospheric diffusion.** *Tokyo, Ochanomizu Univ., Natural Science port,* 10(1):19–30, June **1959.** 7 figs., 15 refs., 21 eqs. English summary p. 19. **DLC**—From ervations of the deformation of smoke lines in the atmosphere, it is concluded that the agents diffusion are circular vortexes existing in the atmosphere. As data of the occurrence frencies of vortexes are not available at present, the diffusion formulas could not be obtained. wever, compared the results with well known formulas of diffusion, the occurrence frequencies vortexes were estimated. *Subject Headings:* **1. Atmospheric diffusion mechanism 2. Cirar vortexes.**—*Author's abstract.*

12N–140 551.511.6:533.6.07

Strom, Gordon H. (*N. Y. Univ.*), **Scale-model wind-tunnel studies on atmospheric-diffun phenomena.** *Hydraulics Conference, University of Iowa, 7th, June 1958, Proceedings,* pub. **59.** p. 91–110. 6 figs., 6 refs., 7 eqs. **DWB** (523 H995pr)—Reports the present status of le model diffusion studies. Following a preliminary discussion of scale factors and modeling blems, 4 experimental studies are reported. Of these, 2 are correlation studies on steam ver plants. These two scale model studies conducted in the New York University wind tunnel w satisfactory agreement with the prototype in some situations and lack of agreement in others. e other two diffusion experiments were conducted in the New York University wind tunnel neutral and unstable thermal conditions. A comparison of these experiments with field studies ws good agreement for the limited range of conditions compared. The paper, however, emsizes the need of additional studies to place diffusion modeling of all levels of complexity on a ner basis. *Subject Headings:* **1. Atmospheric diffusion 2. Wind tunnel experiments.**—*I.S.*

12N–141 551.511.6:551.551.8

†Tien, C. L. (*Dept. of Mechanical Engrg, Princeton Univ.*), **On the eddy diffusivities for mentum and heat.** *Applied Scientific Research, Ser. A,* The Hague, Vol. 8, pub. **1959.** p. –348. 7 refs., 6 eqs. **DWB, DLC**—From a simple consideration, the eddy diffusivities for mentum and heat are shown to be equal in terms of statistical properties of turbulence. A versal semiempirical expression for the eddy diffusivities in a turbulent shear flow is obtained erms of the distance from the solid boundary and flow properties. *Subject Headings:* **1. Eddy usivity 2. Momentum—heat diffusion relationships.**—*Author's summary.*

PART B. ATMOSPHERIC CIRCULATION (551.513)

GENERAL CIRCULATION OF THE ATMOSPHERE (551.513)

12N–142 551.513:551.551:551.525

Laĭkhtman, D. L., **O primenenii teorii podobiia v meteorologii.** [Application of the theory similarity in meteorology.] *Leningrad. Glavnaia Geofisicheskaia Observatoriia, Trudy,* 20(82): **37, 1949.** 67 eqs. **DLC**—The problem of a steady circulation on the rotating Earth, caused a horizontal temperature difference, is treated under similarity considerations. The horizontal ocities and dimensions of the resulting circulation are proportional to the temperature difference inversely proportional to the square root of the mean gradient of the potential temperature. vertical velocities and dimensions are also proportional to the temperature difference The loss of the warmer part is proportional to the third power of the temperature difference. ther problem solved under similarity considerations is the wind distribution for curved isobars, ing a maximum friction height in the center of the basic system and computing the lateral ars. Furthermore, it is shown how to use the similarity method for forecasting the soil surface perature with successive approximations. *Subject Headings:* **1. Similarity method 2. Heat ulation 3. Friction height 4. Soil temperature forecasting.**—*A. Assur.*

12N–143 551.513:551.509.317:551.509.54(

Saito, T., **On the zonal index (2nd report).** *Journal of Meteorological Research,* Tok 5(9):720–723, Nov. **1953.** 3 figs., 6 refs. In Japanese; English summary p. 720.—Follow the first report (*see* 5.9–128, Sept. 1954, *Met. Abs.*) the zonal index, mainly in the Bai-u (rai season from April to Sept. 1952, is investigated and the relationship of precipitation amount in middle part of Japan to both the low and high index, and blocking relation to Bai-u, are determi *Subject Headings:* **1. Zonal index 2. Bai-u 3. Precipitation forecasting 4. Japan.**—*Auth abstract.*

12N–144 551.

Winston, Jay S., (*Ext. Forecast. Sect., U. S. W. B., Wash., D. C.*), **The weather and culation of September 1954.** *Monthly Weather Review,* 82(9):261–266, Sept. **1954.** 6 figs refs.—The subtropospheric circulation for Sept. 1954 resembled, over the Western Hemisph the mean circulation for the summer season for 1954. "The circulation feature most dire associated with U. S. weather during Sept. 1954 was the zonally-oriented continental ridge wh covered the southern two-thirds of the U. S." and under which above normal surface temperatu prevailed. Temperature and precipitation characteristics are discussed and the principal circulat features in other parts of the Northern Hemisphere are described. *Subject Headings:* **1. Atm pheric circulation 2. Air temperatures 3. United States.**—*I.L.D.*

12N–145 551.513:551.557.32(5

Chi, C. H., **On the relationship between general circulation and variation of precipitat in summer and winter in Formosa.** *Meteorological Bulletin, Taipei, Formosa,* 1(1):3–16, Ma **1955.** 26 figs., 6 tables, 13 refs. In Chinese. **DLC**—In this paper an effort is made to anal the causes of precipitation variations in Formosa, and to investigate the relationship between general circulation and pressure. Data used here were obtained, for the most part, during yrs 1910–1938, and are studied with a view of their utilization in long range forecasts. On basis of analysis of the data, it is concluded that the rainfall in the north in winter is influenced the northeast wind, while that in the south in summer is closely related to the southwest wi *Subject Headings:* **1. General circulation-precipitation variation relationships 2. Precip tion variations 3. Formosa.**—*K.C.*

12N–146 551.

Starr, Victor P., **Modern developments in the study of the general circulation of atmosphere.** *Journal of Geophysical Research,* Wash., D. C., 61(2, Pt. 2):334–340, June 19 31 refs. **DLC.** Also issued in: Massachusetts Institute of Technology. Dept. of Meteorol **Studies of the Atmospheric General Circulation II,** Contract AF 19(604)-1000, Final Rep Dec. 31, **1957.** p. 6–12. **DWB**—A summary of a talk given at the Washington Conference Theoretical Physics, held Feb. 1956. The purpose of the discussion was to present a gen account of the research program concerning the study of the global circulation of the atmosph pursued by the author and his colleagues at the Massachusetts Institute of Technology. fundamental aim of the work was to discover the mode of operation of the atmosphere as a engine. Three more or less distinct approaches were involved in the research: 1) an extren extensive study of meteorological data for the Northern Hemisphere; 2) the study of model exp ments; 3) extensive theoretical analyses. As a general conclusion, it would appear that m orologists now have for the first time a correct framework for the discussion and further stud the mechanics of the general circulation. *Subject Heading:* **1. Atmospheric circulation.**—*M.*

12N–147 551.513:551.5

Butzer, K. W. (*Geographisches Institute, Bonn Univ.*), **Mediterranean pluvials and the eral circulation of the Pleistocene.** *Geografiska Annaler,* Stockholm, 39(1):48–53, **1957.** refs. **DWB**—Mediterranean pluvials are considered the direct result of primary changes of general atmospheric circulation rather than as secondary effects of the presence of contine glaciation. The two distinct types of circulation associated with the advance and stand-still pha respectively, of the retreat of the glaciers are: 1) a pronounced long term low index meridi pattern and 2) a high index or zonal circulation. *Subject Headings:* **1. General circulation ing Pleistocene glaciation 2. Pleistocene glaciation.**—*W.N.*

12N–148 551.513:551.509

California. Univ. at Los Angeles. Dept. of Meteorology, **Large scale synoptic proces** Contract AF 19(604)-1286, Final report, June 30, **1957.** 11 articles separately paged. (some fold.), tables, bibliogs., eqs. **DWB** (M13 C153l)—Contents: Article 1. Clapp, Philip The evolution of the general circulation January–February, and July–August, 1949. 3

figs., 20 refs. Article 2. Bjerknes, J., **Hovmöller diagram analysis.** 27 p. 2 figs, tables. icle 3. Bjerknes, J. and Venkateswaran, S. V., **A model of the general circulation of the pics in the winter.** 28 p. 12 figs., table, 16 refs., eqs. (For abstract, *see* 10.8–216, Aug. 9, *Met. Abs.*) Article 4. Bjerknes, J., **The meridional heat flux in summer.** 8 p. 4 figs., (For abstract, *see* 10.8–210, Aug. 1959, *Met. Abs.*) Article 5. Bjerknes, J., **The kinetic ergy of the atmosphere in summer; preliminary note.** 2 p. 2 figs. Article 6. Knox, eph B., **A synoptic study of the intensification mechanism of a different trough.** 167 p. figs., 9 tables, eqs. bibliog. (p. 128–129). Article 7. Knox Joseph B., **On generalized nteropic inertial motion with applications to cyclogenesis** (Pt. 1). 32. p. 6 figs., tables, efs., 42 eqs. Article 8. Lorenz, Edward N., **Generation of available potential energy l the intensity of the general circulation.** 35 p. 4 figs., table, 11 refs., 37 eqs. Also ued in: Pfeffer, Richard L. (*ed.*),**Dynamic of climate.** N. Y., Pergamon Press, 1960. 86–92. 3 figs., 4 refs. Article 9. Mintz, Yale, **On heating models for extended- and g-range numerical weather forecasting and the study of the general circulation.** 20 p. refs., 4 eqs. (For abstract, *see* 9G–58, July 1958, *Met. Abs.*) Article 10. Mintz, Yale, **An pirical determination of surface drag coefficients for extended-range and long-range merical weather forecasting and the study of the general circulation** (preliminary report). p. figs., 13 refs. (For abstract, *see* 8F–81, June 1957, *Met. Abs.*) Article 11. Eliassen, nt. **A procedure for numerical integration of the primitive equations of the two-parameter del of the atmosphere.** 53 p. figs., table, 8 refs., eqs. This project pursued three main ectives: 1) to complete the processing of the numerical data of the General Circulation Project F 19(604)-128); 2) to establish a connection between the research efforts in the field of the eral circulation and those of conventional synoptics; 3) to provide working facilities for promi- t visitors studying problems of their own choice related to the main theme. Clapp, in Article describes and discusses the Northern Hemisphere synoptic developments during the 4 months .–Feb. and July–Aug. 1949, selected for the general circulation research at U.C.L.A. He plies the tools of analysis which have proved to be useful in the time tested routine of the tended Forecast Section. In Article 2, the analysis of the large scale synoptic processes pre- ted by Clapp is supplemented by a study of Hovmöller type diagrams, covering the middle tudes from 35°–65°N. The time coordinate runs from top to bottom of the diagrams, while graphic longitude runs from left to right in the same sense as on a map. The mapped quantity the 500 mb geopotential averaged daily at each 5° meridian over the latitude belt 35°–60°N. ERKNES, in Article 3, presents a detailed dynamic analysis of the general circulation of the de wind zone (5°S–27½°N) from which the atmosphere gains angular momentum through fric- n at the Earth's surface. In Article 4, he analyzes heat flux measurements for 15°–80°N for h day during July–Aug. 1949, and presents these measurements in charts. Article 5 is a pre- inary note concerning the climatological aspects of the field of kinetic energy, based on a study S. V. Venkateswaran and David Stuart. The result of synoptic and dynamic research on intensification mechanisms of a selected diffluent trough in the upper westerlies is presented Knox in Article 6. The structure and evolution of this diffluent trough are described. An egral part of this description is an analysis of the three-dimensional field of motion on the stant pressure surface of 500 mb. From the map sequence describing the evolution of the izontal field of motion the details concerning the parallel evolution of the vertical component the absolute vorticity are computed. Article 7, by Knox, contains a theoretical study on inertial ıtropic oscillations. It expands the concept of Helmholtz instability from straight zonal flow to ved flow with diffluent or confluent streamlines. This study provides tools to be used in future tinuations of synoptic investigations of the kind started in Article 6. Lorenz, in Article 8, kles the problem of deducing the observed intensity of the general circulation from the distribu- n of solar heating. As a by-product he describes a possible mechanism whereby variations of albedo may lead to fluctuations of the general circulation. Mintz, in Articles 9 and 10, is con- ned with long range weather forecasting. In the final paper, Eliassen attempts "to apply a geostrophic forecasting technique to the simplest baroclinic model, namely the two parameter del." *Subject Headings:* **1. Large scale weather processes 2. Atmospheric circulation.**— *itorial note and M.F.H.*

.12N–149 551.513:551.577.32

Murakami, T., (*Met. Research Institute, Japan*), **The mean vertical velocity and heat supply ring the rainy season near Japan.** *Papers in Meteorology and Geophysics,* Tokyo, 8(2):109–, July 1957. 17 figs., 3 tables, 7 refs., 40 eqs **DWB**—The physical significance of the time raged equations of motion is discussed. In the time averaged vorticity equation, the terms pressing the vertical transport of vorticity, the dissipation of vorticity due to friction, and so become important in their magnitude. As for the time averaged thermodynamic equation, the gnitude of the term expressing the heat transfer due to horizontal disturbances is about the

same order as that due to mean horizontal velocity. On the contrary, the heat transfer duc vertical disturbances is extremely small as compared with that due to mean vertical velocity. mean vertical velocity and the mean supply of heat during the rainy season are computed. interesting feature in the patterns is the existence of a marked zone of cooling and of a pronoun downward motion near the so-called Okhotsk High. Finally, the mean stream function and mean velocity potential are obtained. Utilizing the mean velocity potential, the vertical distri tions of divergence at the southwestern part of the Okhotsk high are analyzed. *Subject Headin* **1. Rainy seasons 2. Vertical vorticity during rainy season 3. Heat transfer during ra season 4. Japan.**—*Author's abstract.*

12N–150 551.513.2:551.51

Rodewald, Martin, **Die nordatlantische Zirkulation im Oktober 1957.** [The North Atla circulation in Oct. 1957.] *Der Wetterlotse,* Hamburg, No. 124:248, Nov. **1957. DWB**—T brief report on air circulation conditions in the North Atlantic during Oct. 1957, gives informat on the intensity of both cyclonic action centers, the Icelandic and Aleutian lows, as well as p cipitation amounts in island and coastal areas, and prevailing wind speeds. *Subject Headings:* **Atmospheric circulation 2. Cyclonic activity 3. North Atlantic.**—*A.M.P.*

12N–151 551.513:551.577.37:551.515.1(

§Dunn, Carlos, R. (*U. S. W. B.*), **The weather and circulation of July 1958: heavy p cipitation associated with a trough in Central United States.** *Monthly Weather Review,* Wa D. C., 86(7):268–277, July **1958.** 11 figs., 2 tables, 5 refs. **DWB, DLC**—A large amplit wave of an outstanding monthly mean circulation pattern at 700 mb for July 1958 is discussed. extended from the central Pacific to central North America. Vast areas of the U. S. recei heavy precipitation. Over central U. S. there were heavy rains, with cool temperatures dur July. There were no tropical storms in the North Atlantic areas. *Subject Headings:* **1. Trou 2. Excessive rainfall 3. Central United States**—*N.N.*

12N–152 551.513:551.551.5:551.547:551.52

Gruza, G. V., **O zonal'nykh kharakteristikakh makroturbulentnosti.** [Zonal characteristic macroturbulence.] *Akademiia Nauk Uzbekskoĭ SSR, Izvestiia, Ser. Fisiko-Matematicheskikh N* No. 2:57–67, **1958.** 4 figs., 3 tables, 10 refs., 13 eqs. Uzbek summary p. 67. **DLC**—The aut presents an example of the computation of the zonal characteristics of macroturbulence for June July 1953 on the basis of daily weather data of the Central Institute of Forecasting. The metho calculation was essentially that of A. S. Monin (*see* 8.10–138, Oct. 1957, *Met. Abs.*). Calculati were made for 30°–80°N lat. The initial data were the geopotentials of the 700 mb isobar surf and the relative topography 500/1000, representing the mean temperature of the lower half of atmosphere. The mean zonal value of the zonal velocity was determined by

$$\bar{v}_\lambda(\theta) = \frac{0.62}{\cos\theta}\sigma_\theta,$$

where $v_\lambda(\theta)$ = zonal value of velocity at latitude $\varphi = 90 - \theta$; θ = complement of latitude; $\sigma_\theta = \phi(\theta +$ $-\phi(\theta - 5°)$ = increase of geopotential of the 700 mb surface when θ increases by 10°. The equati for the component of the correlation tensor of the velocity field, for the density of the macroturbu heat flow, for variation of the local circulation index with latitude, for rate of exchange of kin energy between regular and nonregular components of large scale movements, for the differ components of kinetic energy averaged over 24 hrs and the coefficient of macroturbulence are sented. The mean monthly values of the zonal characteristics are presented in tables and analy *Subject Headings:* **1. Macroturbulence 2. Zonal circulation.**—*I.L.D.*

12N–153 551.511:551.

Huss, Abraham, **Preliminary working formulae for a numerical general circulation exp ment on an ocean covered planet.** Jerusalem. Hebrew Univ. Dept. of Meteorology, Cont AF 61(052)-60, Technical (Final) Report, Aug. 31, **1958.** 12 p. 2 refs., 51 eqs. **DWB** (M(0 J65te)—Huss develops formulas for the numerical calculations of a general circulation exp ment on an ocean covered planet in which the initial ocean temperature is a function of latit and longitude. The finite difference equations in scaled form are derivd, with the initial boundary conditions specified. *Subject Heading:* **1. General circulation models.**—*E.Z.S.*

12N–154 551.

Baev, V. K., **K teorii obshcheĭ tsirkuliatsii atmosfery.** [Theory of the general circula of the atmosphere.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy,* No. 85, **1959.** p. 3– 4 refs., 119 eqs. **DWB**—The author presents a theoretical mathematical description of the gen circulation of the atmosphere in a most general treatment of the problem. Primarily the r

ar and viscosity terms are taken into account in the differential equations of the problem and the nonadiabatic effects, which play a fundamental role in the general circulation of the atmosre. The relationship of the thermal properties of the underlying surface and geographical conates is considered more rigorously The contents of this paper include the following: the damental equations, namely those of motion, expressed in spherical coordinates, of continuity of thermodynamics; equations for advection of radiational heat; the transition to nondimenal parameters; the equations for temperature; reduction of the problem to zero initial data. *ject Heading:* **1. Atmospheric circulation theories.**—*I.L.D.*

12N–155 551.513:551.58(98)

Dzerdzeevskiĭ, B. L., **Problemy klimatologii Artiki.** [Problems of Arctic climatology.] *blemy Severa,* Moscow, No. 3:168–179, **1959.** 2 maps, 5 figs., 7 refs. **DLC**—Twenty-five of coordinated work in the Arctic region are summarized in respect to basic problems of the , and probability of expanded activities in future decades, with emphasis on the economic elopment of the Polar regions of the U.S.S.R. The first problem concerns the development expansion of the sea and air routes for mass cargo transportation. Meteorological and areocal observations indicate that the synoptic and climatic analysis of the Central Arctic should be limited to the boundaries of this region, but ought to be expanded to include much larger as. Aviation weather forecasts are often sufficient for a few hours in advance and for limited as only. Theoretical forecasts have been expanded to a few days, but strategic considerations uld govern the advisability of worldwide weather forecasts in future years. An analysis of y years' observations, with 20 graphic illustrations of the variations of climatic elements, 1900–9, is presented. As a result of this analysis, the Arctic conditions are considered not just in tion to this region, but to the atmospheric processes of the entire Earth. The future problems Arctic climatology are also connected with solar activities. Therefore, methods must be deped for "super" long range forecasting. *Subject Headings:* **1. Arctic climatology 2. Long ge forecasting.**—*N.P.S.*

12N–156 551.513:551.558.21 532.5:608.5

Oi, Masamichi (*Osaka Gakugei Univ.*), **Rotating dishpan as a numerical integrator for the e scale topographical perturbation of the hemispherical zonal current.** *Meteorological iety of Japan, Journal,* Ser. 2, 37(5):147–159, Oct. **1959.** 10 figs., 9 refs., 9 eqs. Japanese mary p. 159. **DWB, DLC**—The terms for Reynolds stresses in the dimensionless equation notion for the large scale topographical perturbation of a zonal current are shown to be negli- e in the atmospheric prototype and dishpan model for a two-dimensional barrier case and conently for a three-dimensional barrier case also. Thus the only one dimensionless parameter s out to be Rossby's, provided the ratio of the topographical height to the homogeneous atmosric height is equal to that of the height of the barrier model to the depth of the rotating fluid he rotating dishpan, even in the three dimensional barrier case. The different rotating speed ach latitude on the atmospheric prototype can be simulated even in the rotating dishpan by tiplying the topographical height by the sine of latitude (sine φ). Thus the Northern Hemi- ere circulation can be simulated in the rotating dishpan for several cases of different meridional ributions of the basic zonal current and is to be compared with 500 mb normal contour charts corresponding meridional distribution of the basic zonal current to verify the rightness of the or's theoretical conclusions. However, in this paper only one case of distribution of the basic l current is reported, simply because mechanical devices to produce other cases were not lable for financial reasons. *Subject Headings:* **1. Rotating dishpan 2. Zonal currents 3. thern Hemisphere circulation 4. Meridional circulation.**—*Author's abstract.*

12N–157 551.513:551.510.53

Teweles, Sidney (*U. S. Weather Bureau*), **Structure and circulation of the stratosphere.** *erican Geophysical Union, Transactions,* 40(1):84–88, March **1959.** 5 figs. **DWB**—A gross sion of the stratosphere into upper and lower layers and into equatorial midlatitude, and Polar s, can be made. The large scale patterns of the stratosphere and troposphere may be intered. The correlation of ozone variations in addition to other measurements may help to find and where the relationship is activated. Circulation changes in the stratosphere may provide s in long range forecasting of surface conditions, and tropospheric events may be used in casting stratospheric events. *Subject Headings:* **1. Upper air circulation 2. Stratospheric cture.**—*E.Z.S.*

12N–158 551.513

Tsuchiya, Iwao (*Met. Agency, Tokyo*), **On the variation of general circulation in 1901–** . *Meteorological Society of Japan, Journal,* Ser. 2, 37(5):203–208, Oct. **1959.** 3 figs., 16

refs. In English; Japanese summary p. 208. **DWB, DLC**—A discussion of the variatio pressure distribution as an indicator of the general circulation. The author shows that the ch of mean surface pressure is not uniform in the Northern Hemisphere, and that accordingly change of climate (temperature and other climatic elements) is not uniform for all regions, bec the change in the mean pressure trend is an indicator of general circulation. Temperature more variable element than mean pressure; data from many stations are needed to examine phenomena. *Subject Headings:* **1. General circulation patterns 2. Northern Hemisph** —*K.C.*

12N–159 551.513:551.510.53:551.524.73

Warnecke, G. (Berlin), **Über die Temperatur-und Zirkulations-schwankungen in arktischen Stratosphäre.** [On the temperature and circulation variations in the Arctic st sphere.] *Polarforschung,* Kiel, Ser. 4, 29(1/2):169–170, **1959.** 6 refs. **DLC**—An analysi stratospheric temperature at the 100 mb layer during the 8 winters of 1950/51–1957/58 at St Alert, Ellesmere Island, shows a sudden warming during Jan.–March. The stratospheric cir tion of the Northern Hemisphere remained disturbed after the warming, and the strong vortex was not regenerated in any of the cases studied. *Subject Headings:* **1. Stratosph temperature variations 2. Stratospheric circulation 3. Arctic.**—*O.T.*

12N–160 551.513:551.5

Lecce, B. and Del Trono, F., **Variazioni medie stagionali nella circolazione atmosferi previsione a lunga scadenza.** [Mean seasonal variations of atmospheric circulation and range forecasting.] *Associazione Geofisica Italiana, 9th, Rome, Nov. 1959. Atti,* pub. [1960], p. 17–21. 5 figs., 2 refs. Italian and English summaries p. 21. **DWB**—The principles concerning long range forecasting are briefly explained and the necessity of havi method, based on general criteria, and taking into account the peculiar dimensions of the pro in space and time, is presented. For this purpose a basic mean field or "permanent baric fi which in its annual evolution appears regular and as such seems to condition the evolution o waves of the shorter period, has been represented, using significant values of the carrying w at 500 mb distributed throughout the Northern Hemisphere. *Subject Headings:* **1. Atmosph circulation variations—long range forecasting relationships 2. Northern Hemisphere c lation.**—*Author's abstract.*

Mechanics And Thermodynamics (551.513.1)

12N–161 551.513.1:551.

†Pogosian, Kh. P., **Sezonnye kolebaniia obshcheĭ tsirkuliatsii atmosfery.** [Seasonal flu tion of general atmospheric circulation.] *Leningrad. Tsentral'nyi Institut Prognozov, T* 1(28):7–88, **1947.** 37 figs., 10 tables, 133 refs. Supplement of 25 maps and 5 tables. **DI** Mean monthly maps of absolute and relative topography of the Northern Hemisphere iso surfaces presented in this paper have been plotted for the first time on the basis of com aerological data for the last 6 yrs. This data provided a method of calculating nonadve temperature changes for any period and of expressing by changes of temperature in the air co the amount of heat received or emitted by the air. With the aid of these values, it became pos to obtain the seasonal mean temperature field of the lower troposphere which coincides ro with the actual temperature field of the season. The mean temperature field thus established then been regarded as a high altitude baric fild, inasmuch as the difference between absolute relative topography of a 500 mb surface is not important for a mean field. The maps of re topography enabled the author to introduce qualitative characteristics of the part played by in the general circulation of the atmosphere. Due to this, the author identified the regions the greatest reserve of heat, and the main frontal zones in the troposphere, the location structure of which determine the basic features of seasonal circulation, as they are the zones great deal of cyclonic and anticyclonic activity. The recurrence of cyclones and anticyclones their tracks is conditioned by seasonal temperature contrasts and by the structure of the altitude baric area. Thus, proceeding from the contrasts of temperature and of the structu the high altitude baric field, the author explains the geographic distribution of surface patterns in winter and summer. *Subject Headings:* **1. Atmospheric circulation 2. Baric to raphy 3. Air mass transformation 4. Tropospheric temperatures 5. Northern Hemisp** —*A.M.P.*

12N–162 551.513.1:

Jonson, Russell Martin (*U. S. Navy*), **Some solutions to equations of motion in equatorial regions.** Thesis (M.S.)—U. S. Naval Postgraduate School, Monterey, Calif **1952.** 17 p., 5 figs., 7 refs., 17 eqs. Photostat of typescript. **DWB**—Paper discusses moti

nction of y alone, spatially independent motion with variable Coriolis parameter, and spatially pendent motion for a certain pressure distribution. Conclusion is that equations of motion be solved for equatorial regions only, with restrictive assumptions, even for simple pressure s. The solutions give velocity fields resembling observed mean motions; they appear to be of practical use in routine weather analysis, and are laborious and time consuming. *Subject lings:* **1. Equatorial circulation theory 2. Equations of motion.**—*M.R.*

12N–163 551.513.1

Syōno, Shigekata, **The new theories of the general circulation of the atmosphere. Syn- c report.** *Oceanography and Meteorology*, Nagasaki, 6(2/4):95–108, Dec. **1954.** 30 figs., bles, 61 refs. In Japanese. **DWB**—Progress in the field of atmospheric circulation theory ng the last three decades is reviewed. The principal theories are discussed in some detail and rated with explanatory diagrams. The survey covers American, British, German, Scandi- an and Japanese literature. *Subject Heading:* **1. General circulation theories.**—*G.T.*

12N–164 551.513.1:551.515:532.59

Anderson, R., **Wave motion in the upper westerlies.** *Canada. Meteorological Div., CIR-*, TEC-207, Jan. 18, **1955.** 9 p. 9 figs., 11 refs. **DWB, DLC**—This paper is a brief review ave motion in the upper westerlies with particular reference to long waves and short waves. ng wave pattern exists in the westerlies, upon which are superimposed waves of much shorter length. The short waves are associated with surface disturbances, and their trajectories ne the long wave pattern. A proposed method for the resolution of long waves and short s is outlined. In addition, a technique for forecasting their motion is included. *Subject lings:* **1. Waves in the westerlies 2. Long wave patterns 3. Waves in the westerlies casting.**—*Author's abstract.*

12N–165 551.513.1

California. University at L. A. Dept. of Meteorology, **Investigations of the general cir- ion of the atmosphere.** Contract AF 19(122)-48, Final Report, March 15, **1955.** figs., s, refs., eqs. **DWB**—Papers prepared under a 6-yr contract dealing with a detailed analysis e mechanism of large scale flow over the Northern Hemisphere, with the ultimate aim of scale forecasting. The first step was primarily a hemisphere-wide short range forecasting e strength of the zonal circulation, concentrating on the year 1949, with emphasis on numerical sis. Contents: Art. 1. Mintz, Yale and Dean, Gordon, **The observed mean field of motion e atmosphere.** (For abstract, *see* 4.6–9, June 1953, *Met. Abs.*); Art. 2. Mintz, Yale, **The rved zonal circulation of the atmosphere.** (For abstract, *see* 6.7–167, July 1955, *Met.* ; Art. 3. Mintz, Yale, **Zonal-index tendency equation.** In this paper, a more exact form e zonal momentum equation is derived from the complete equations of motion and continuity ass, considering the latitudinal change of the poleward eddy flux, the altitude dependence of ertical eddy flux, as well as the pressure field due to mountains. Suggestions for a gradual ation are given. Art. 4, Mintz, Yale, **The geostrophic poleward flux of angular momentum e month of January 1949.** (For abstract, *see* 4.10–118, Oct. 1953, *Met. Abs.*); Art. 5, z, Yale, **The mean geostrophic poleward flux of angular momentum and of sensible heat e winter and summer of 1949.** (For abstract, *see* 6.11–191, Nov. 1955, *Met. Abs.*); Art. 6, z, Yale and Lang, John, **A model of the mean meridional circulation.** (For abstract, *see* 03, June 1957, *Met. Abs.*); Art. 7, Palmén, E. H., **On the mean meridional circulation in atitudes of the Northern Hemisphere in winter and the associated meridional and ver- flux of angular momentum.** (For abstract, *see* 6.11–202, Nov. 1955, *Met. Abs.*); Art. 8, z, Yale and Munk, Walter, **Effect of winds and bodily tides on the annual variation in ength of day.** (For abstract, *see* 6.8–261, Aug. 1955, *Met. Abs.*): Art. 9, Mintz, Yale and Shih-Kung, **Zonal-index tendency equation and its application to forecasts of the zonal .** (For abstract, *see* 3.9–96, Sept. 1952, *Met. Abs.*); Art. 10, Lorenz, Edward N., **Geo- hic and ageostrophic poleward flux of angular momentum.** The geostrophically computed s a good first approximation to the true flux, but certain systematic errors remain, which e eliminated. The theoretical discussion is devoted to this effect, analyzing the "partitioning" kinetic energy into E–W and N–S motions, and studying the skin frictional drag. Art. 11, nes, Jakob A. B., **Preliminary study of the day to day changes of angular momentum g January–February and July–August 1949.** (For abstract, *see* 6.11–181, Nov. 1955, *Met.* ; Art. 12, Kao, Shi-Kung, **On total momentum vorticity with application to the study general circulation of the atmosphere.** (For abstract, *see* 9.7–160, July 1958, *Met. Abs.*); 3, Mintz, Yale, **The total energy budget of the atmosphere.** (For abstract, *see* 8.5–190, 1957, *Met. Abs.*); Art. 14, Pisharoty, Pisharoth R., **The kinetic energy of the atmosphere.** abstract, *see* 5.7–9, July 1954, *Met. Abs.*); Art. 15, Pisharoty, Pisharoth R., **Some aspects**

of the geostrophic poleward flux of sensible heat. (For abstract, *see* 5.2-97, Feb. 1954, *Abs.*); Art. 16, Mintz, Yale and Kao, Shi-Kung, **The contour-channel method of compu the geostrophic poleward flux of sensible heat, angular momentum, or other atmosph properties.** (For abstract, *see* 5.5–97, May 1954, *Met. Abs.*). *Subject Headings:* **1. Gen circulation 2. Circulation statistics 3. Hydrodynamics 4. Northern Hemisphere.**—*A. As*

12N–166 551.5

Dunn, Carlos R. (*Ext. Forecast Sec., U. S. W. B., Wash., D. C.*), **The weather and circ tion of October 1955: A month with a double index cycle.** *Monthly Weather Review,* W D. C., 83(10):232–237, Oct. **1955.** 7 figs., 15 charts, 4 refs. **DWB**—During this period 5-day mean zonal index underwent two cycles each with a period of about two weeks. The i initially normal showed changes as large as 6 to 7 m/sec. The changes and extremes in the culation during this month are calculated with the aid of 700 mb, 5-day mean charts and general circulation is described with the aid of charts. The circulation patterns in the U. S., w became progressively more cyclonic in the West and cyclonic in the East from Sept. through is described. *Subject Headings:* **1. Zonal index 2. Atmospheric circulation 3. United St** —*I.L.D.*

12N–167 551.513.1:551.51

Romov, A. I., **Ob izmenenii vikhria i tsirkuliatsii skorosti v atmosfere.** [Change of the vort and velocity circulation in the atmosphere.] *Kiev. Ukraine. Nauchno-Issledovatel'skiĭ G meteorologischeskiĭ Institut, Trudy,* 4:18–28, **1955.** fig., 4 refs., 24 eqs.—In the equation

$$\frac{dT}{dt} = (N' - N'') - 2w\frac{d\Sigma}{dt},$$

which describes the circulation for a baroclinic atmosphere moving without friction in the Co field, the first part $N' - N''$ (N' and N'' = corresponding number of positive and negative unit iso isostere solenoids) is widely used, e.g., to explain the circulation of frontal surfaces, the circula in thermal troughs and mountain valley winds, etc.; the second part dealing with the Earth's tion, $2w(d\Sigma/dt)$ has limited application because of its general form. In order to eliminate th determinacy of the Coriolis expression the author develops equations for expressing the accelera of the circulation by magnitudes characterizing the motion of a fluid. The derivation of this equa is based upon the known general theory of the change of circulation:

$$\frac{dT}{dt} = \mathscr{S}_{(i)}\left(\frac{\vec{dv}}{dt}\cdot\vec{ds}\right).$$

Equations are derived for describing the movement of a vortex and the magnitude of the move of the circulation associated with the influence of the Coriolis force and the relationship bet these magnitudes and that giving the effect of baroclinicity. Using the equation to calculat variation of circulation in a given plane the author computes that at individual points of a thu storm cloud there may be a vortical motion with a vertical axis which may play an important in the development of a tornado. The application of this equation to the origin of a torna discussed. *Subject Headings:* **1. Baroclinicity 2. Atmospheric circulation theories 3. Coriolis 4. Vortex movement.**—*I.L.D.*

12N–168 551.513.1:551.515.8(213):551.5

Goldbrunner, A. W. (*Venezuelan Met. Service*), **The intertropical convergence zone, w in the easterlies and the formation of hurricanes to the east of the Lesser Antilles.** Caribbean Hurricane Seminar, Ciudad Trujillo, Feb. 1956, **Final Report of the Seminar, 1956.** p. 80–92. 20 figs., 14 refs.) **DWB**—A summary of the synoptic situations observe the area of the Atlantic, to the east of the Lesser Antilles and north of the coast of South Am Concepts of the intertropical depression with its convergence zone and the deepening of eas waves lead to the conclusion that these systems play a secondary role in the formation of hurri in this zone. There must be a surprisive and sudden impulse in the atmosphere that almost i diately causes the formation of hurricanes; neither the convective nor frontal, nor Riehl's t explains this. A primary impulse actuates the atmospheric energy. A cold air droplet ca as a trigger for such an impulse. *Subject Headings:* **1. Hurricane formation theories 2. C bean Region.**—*E.Z.S.*

12N–169 551.513.1:551.515.13:551.5

†Brádka, Jan (*Hydrometeorologiches Institut, Prague*), **Der Jahresverlauf der zyklonalen antizyklonalen Aktivität auf der Nordhemisphäre.** [Annual course of cyclonic and anticy activity in the Northern Hemisphere.] *Studia Geophysica et Geodaetica,* Prague, 1(2):342

7. 21 figs., 3 tables, 20 refs. **DWB**—A comprehensive analysis of the results of observations the character and intensity of the atmospheric circulation in the Northern Hemisphere on the is of an investigation of the positions and values of the deepest cyclones and the highest anti-lones. The daily maps of the Northern Hemisphere for the period 1923–1938 were used. Six ural seasons whose circulation is described in detail were selected on the basis of the intensity variety of cyclones and anticyclones. The circulation characteristics of the summer monsoon the Christmas warming-up are discussed. A relationship is established between the circulation the Atlantic European region and the circulation of other parts of the Northern Hemisphere. a on cyclone and anticyclone frequencies are presented in tables. *Subject Headings:* **1. Cy-ne frequencies 2. Anticyclone frequencies 3. Northern Hemisphere.**—*Based on Russian tract, I.L.D.*

12N–170 551.510.5:551.513.1

†Chicago. Univ. Dept. of Meteorology, **Studies in experimental hydrodynamic analogues the atmosphere.** Contract AF 19(604)-1292, Final Report, Dec. **1958.** 25 p. of text, 16 p. bibliog. 7 articles with various pagings. **DWB**—Includes abstracts of papers on completed ntific topics by Herbert Riehl's group and a section summarizing briefly the work done on a nber of experiment series which had not yet been completed, as well as research on the im-vement of apparatus and techniques. A general bibliography, which supplements that in the 6 report, includes additional published laboratory papers and a number of reports on related ics and techniques. The latter appeared subsequent to the 1956 bibliography or were discovered ce the earlier compilation. Papers 1 and 2 by Riehl and Fultz, give results of the analysis the first major three-dimensional experiment on steady Rossby-regime waves in an annulus ave number three). The first results of even more detailed three-dimensional measurements on dley-regime axisymmetric trade-cell motions are discussed in papers 5 and 7 by Faller and isänen. Fultz, in Paper 3, discusses homogeneous fluid experiments with an oscillator in a ating cylinder, and in Paper 4, discusses briefly measurements on vacillating behavior (index les) in annulus wave motions both for dishpan proportions and for tall annuli similar to Hide's 58). Paper 6, by Fultz, discusses another related type of wave behavior involving well defined up propagation phenomena when conical bases are introduced in the annulus waves. *Subject adings:* **1. Atmospheric model experiments I. Riehl, Herbert II. Fultz, Dave** (*project .*).—*Author's abstract.*

12N–171 551.513.1(99)

Pogosian, Kh. P., **Osobennosti tsirkuliatsii atmosfery v Antarktike.** [Features of atmos-ric circulation in Antarctica.] *Meteorologiia i Gidrologiia,* Leningrad, No. 8:3–10, Aug. **1958.** gs., 3 tables, 5 refs. **DWB, DLC**—The common features and differences in the temperature imes in the Arctic and Antarctic, and the circulation of Antarctica are examined. The winter summer air temperature is 8–18°C higher in the Arctic than in the Antarctic. The winter perature difference between corresponding heights in the Arctic and Antarctic diminishes in troposphere but increases anew in the stratosphere. In summer the diminution in the differ-es continues into the stratosphere, attaining zero between 200 and 100 mb. The differences ween summer and winter temperatures in the North and South Poles show that in the former temperature difference diminishes with height in the troposphere but increases in the strato-ere; in the latter the temperature differences increase with height, except at 650 mb. The erlatitudinal exchange is greater in the Northern than in the Southern Hemisphere. Wind in-sity, cyclonic trajectories, and horizontal transport of heat are greater in the North than in South Pole. The high wind velocities observed in central Antarctica are the result of idional exchange at high latitudes in connection with intense cyclonic and anticyclonic activity, as a result of physical geographic conditions they proceed differently from similar processes the Arctic. The pressure field and atmospheric flow in Antarctica, while continually changing, niform at all levels at any instant. In the lower troposphere pressure structures become de-med when encountering Antarctica; the southern periphery of these pressure structures specula-ly constructed on surface weather maps of Antarctica, does not actually exist. The moving ssure formations usually possess a distinct cyclonic or anticyclonic circulation system only in lower 2–3 km. Above these, there is a frontal zone aloft with horizontal contrast of tempera-e and jet streams. The cold cyclones aloft, tending to become thermally homogeneous, are sistationary.' Corresponding to the atmospheric circulation in the Southern Hemisphere there ur frequent changes in the structure of the pressure field aloft and large pressure oscillations. e frequencies of the heights of isobaric surfaces indicate that both cyclonic circulation systems h rather low pressure and anticyclonic systems with high pressure have a similar probability over tarctica. In the cold season the cyclones over the Weddell, Ross and Bellingshausen Seas ome part of the Antarctic cold depression system. Blocking of these high cyclonic formations

occurs frequently in the warm season from the side of the warm north and regions of relativ high pressure. During the meridional transformation of the thermobaric field of the atmosphe which is accompanied by intensified advection of heat southward, frontal zones aloft and cyclo- a anticyclogenesis intensify. Data are presented on the mean temperatures and differences for s tions at the North Pole (SP-4, SP-7) and at the South Pole (Amundsen-Scott), differences betwe temperature aloft for summer and winter months, frequency of height of isobaric surfaces 500 a 200 mb in Jan.–Feb. 1958 and in July–Aug. 1957. AT_{200} maps are also presented. *Subj Headings:* **1. Antarctic circulation 2. Antarctic temperatures 3. Antarctic meteorology Antarctica.**—*I.L.D.*

12N–172 551.513.1:551.511(9

†*§Pogosian, Kh. P., **Ob atmosfernoi tsirkuliatsii v Antarktike.** [Antarctic atmospheric c culation.] (In: Sovetskaia Antarkticheskaia Ekspeditsiia, 1955–, **Klimat Antarktiki.** Mosc **1959.** p. 216–251. 16 figs., 7 tables, 12 refs.) **DLC** (QC994.9.K6), **DWB** (M82.1/99 M886k —This article includes a comprehensive study of the distribution of the summer and winter te peratures in the troposphere and stratosphere over the Antarctic or Arctic, an attempt to expl the existing differences between these two areas and an examination of the typical circulation o Antarctica during different seasons. Data on vertical temperature distribution during the vari seasons for different stations in the Antarctic and Arctic and absolute topography maps for d ferent locations are presented. The difference of tropospheric temperature between the North a South Poles in all seasons is a consequence of its greater cooling in Antarctica. The more inte cooling in Antarctica leads to a reduced meridional circulation and comparatively slight advecti heat. In the stratosphere, seasonal radiation conditions are similar over both poles. The diff ence in winter temperature value results, as in the troposphere, from more intense heat advecti in the Arctic and weak advection in the Antarctic. In summer, the stratosphere temperature determined chiefly by radiation conditions, so that the summer temperature distribution is simi over both poles. The inversion type of tropopause is characteristic of both poles in summer; both, the height of the tropopause is about 9 km. Frontal movements are more frequent in Central Arctic than in the Antarctic and are more intense in the former. In the interior of South Pole area, the cyclones, although frequent and deep, do not proceed freely across the c tinent, where the mean altitude is 3 km. Cyclones approaching Antarctica fill up in the lo levels on colliding with a high obstacle. Air flow over Antarctica proceeds freely. The structu of the pressure field aloft, and hence the nature of the circulation, are almost the same as at 700 mb level. As a result of the small scale interlatitudinal exchanges in the high latitudes the Southern Hemisphere, the symmetrical position of the ice zones around the South Pole and cooling of air masses, there arises a region of cold which differs from that in the Arctic. the Antarctic the seasonal cold region has a more concentric form. The pressure fields aloft the Arctic and Antarctic differ. The frequent deep cyclones around Antarctica leave a percepti trace in the pressure field of the mean troposphere. Since deep cyclones are frequent along Antarctic coasts, the horizontal pressure gradient is directed from Central Antarctica towards oceans. As a result of this gradient, the region of high pressure gradually diminishes with hei over Central Antarctica and in the lower troposphere it is transformed into a cold depression al There is no permanent Antarctic anticyclone resulting from the cooling of a layer of air over glacial cover of the continent. The region of comparative high pressure in the middle and lo troposphere is, instead, a consequence of the frequent cyclonic activity over the periphery Antarctica. *Subject Headings:* **1. Atmospheric circulation 2. Antarctica.**—*I.L.D.*

12N–173 551.513.1:551.510.53

Chen, Shou-chün and Hsiao, Wen-chün (*Faculty of Geophysics, Peking Univ.*), **Variation circulation over Asia from winter to spring.** *Peking. Univ., Journal* (*Acta Scientiarum N uralium Universitatis Pekinensis*), No. 3:231–236, **1959.** 6 figs. In Chinese; English summa p. 236. **DLC**—As winter turns to spring there is a quick change of upper air circulation o Asia. The change is characterized by a sudden weakening of the subtropical jet stream. The after the typical spring circulation is established, the quasistationary cold high disappears and moving cyclones and anticyclones appear. *Subject Headings:* **1. Stratospheric circulation General circulation variations 3. Asia.**—*Authors' abstract.*

12N–174 551.51

Grigercsik, Jeno, **Észrevételek a nagy légkörzés elméletéhez.** [Notes on the theory general circulation.] *Időjárás,* Budapest, 63(6):368–369, Nov./Dec. **1959.** fig. **DLC**—Obj tions to the generally accepted Bjerknes-Bergeron theory are presented. In the case of a n rotating Earth, a zenithal circulation would exist, with air circulation between the terminator a the zenith, rather than between the equator and the poles. The author conceives of the Eart circulation as a result of the zenithal and Polar circulation. The Bjerknes-Bergeron theory

ed on a purely Polar circulation concept. The editor, in a note, expresses his opinion that since velocity of rotation at the equator is 465 m/sec, the zenithal circulation system would need elocity above the velocity of sound to be fully developed. GRIGEROCSIK's circulation system therefore be considered only as a weak modifying factor. *Subject Heading:* **1. General cir-ation theories.**—*O.T.*

12N–175 91.04(99):551.513.1

Khromov, Sergeĭ Petrovich, **Atmosfernaia tsirkuliatsiia i pogoda na puti "Ob'" v plavanii 6–1957 gg.** [Atmospheric circulation and weather during the trip of the "Ob" in 1956–1957.] *ietskaia Antarkticheskaia Ekspeditsiia, 1955–, [Materialy]*, Vol. 5, issued Leningrad **1959.** 27–83. 13 figs., charts p. 78–83, 5 foot-refs. **DLC**—During its second Antarctic trip (1956– the Diesel-ship "Ob'" twice passed the equator (in the Atlantic Ocean during Nov. 1956 and ian Ocean during May 1957). Trips were made from the southern tropical zone to the tarctic and in Antarctic waters between the 90° and 20° meridians. The aerometeorological up of this expedition conducted 8 observations every day at ground stations and also two iosonde ascents. Moreover, observations were made on cloudiness (with photographs), tem-ature, barometric pressure, wind direction and velocity. The characteristics of the weather and changes were described for each geographic region in detail and coordinated with the altitude data of other localities. Considerable attention is given to the characteristics of clouds in pical and Antarctic zones at different periods of the year. Cape Town was visited by the "Ob'" ee times. Attention is also given to ice conditions and concentration of ice in different latitudes he region of Mirny base. Air circulation and pressure distribution were represented by isolines the map of the whole Southern Hemisphere from the South Pole to the equator. Meridional ribution of wind velocity, pressure, and temperature are illustrated on the chart from 13°N to S of the Indian Ocean. The vertical cross section of the temperature distribution is shown m 90°S to 9°N and from sea level to an altitude of 8 km. The appendix contains 12 typical ological diagrams. *Subject Headings:* **1. Atmospheric circulation 2. Mirny, Antarctica.** *V.P.S.*

12N–176 551.513.1:551.555.1

Rudloff, Willy, **Kant's Theorie der Winde.** [Kant's wind theory.] *Wetterlotse*, Hamburg, 147/148:133–136, June **1959. DWB**—KANT has formulated independently of HADLEY the cept that the trade winds are winds which blow from the Pole to the equator and are deflected the right in the Northern Hemisphere and to the left in the Southern Hemisphere. KANT ed his theory on two rules: 1) A greater amount of heat, which acts upon one atmospheric a more than upon another, causes a wind to blow to the heated area and this wind continues long as the warmth of the area continues. 2) A wind that blows from the equator to the Pole omes more westerly the longer it blows, and wind blowing from the Pole to the equator alters directions in a collateral motion from the east. The latter rule anticipates the Coriolis force. ese two rules KANT considered as explaining the east wind which prevails in the Atlantic and ific Oceans between the tropics, as well as the periodic winds on the Arabian Sea, the Persian f and the Indian Ocean. On the basis of sparse wind observations and his wind laws, KANT mated the existence of a continent in the Pacific Ocean. *Subject Headings:* **1. Trade wind t balance 2. Trade wind circulation.** *I.L.D.*

12N–177 551.513.1:551.515.23

Tanabe, S., **Seasonal variations in the frequency of typhoons related to the general cir-ation of Northern Hemisphere.** *Journal of Meteorological Research*, Tokyo, 11(7):561–566, **1959.** 6 figs., 2 tables, 4 refs. In Japanese; English summary p. 561. **DWB, DLC**—The uency of typhoon formations in the months June–Sept. was studied in relation to the general ulation of the Northern Hemisphere, and it revealed that the following facts exist: 1) In the mer when the typhoon formations are frequent, the subtropical upper high is intensive and rather north. Moreover, the high has two centers, at the eastern and western parts of the th Pacific Ocean, and a remarkable negative deviation area prevails along the 170°W meridian. In the summer when the typhoon formations are few, the zone of the upper westerlies lies tively south and most notable in the eastern and western parts of the North Pacific Ocean. In the 5-day period just before the active formation period of typhoons, the meridional circula-is particularly intensive. *Subject Headings:* **1. General circulation 2. Typhoon frequencies Meridional circulation 4. Northern Hemisphere 5. North Pacific Ocean.**—*Author's ract.*

12N–178 551.513.1:551.524.3

Vorob'eva, E. V., **Opyt kompleksnogo ispol'zonvaniia kharakteristik form i intensivnosti osfernoi tskirkuliatsii dlia analiza termicheskikh anomalii.** [An attempt at using combined

characteristics of form and intensity of atmospheric circulation in the analysis of temperat anomalies.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy,* No. 89:40–52, 19 10 figs., 4 refs. **DLC**—The thermal anomalies of the atmospheric circulation are analyzed using the fundamental circulation types of G. Ia. Vangengeĭm together with the intensity circulation, i.e., the intensity of transport of air masses regardless of direction. The indices circulation interimly prepared by A. L. Kats (*Moscow. Tsentral'nyĭ Institut Prognozov, Tru* No. 49:3–180, 1957) are used; these indexes are a physically based evaluation of the circulati since they represent the specific flux of a mass of air in unit time over the region under conside tion and they have been computed for the entire Northern Hemisphere, for individual secti such as the Eurasian and American halves and for individual small sectors (30° lat. and 5° lon Graphs show the relationship of daily temperature anomalies for the meridional circulation t (*C*) to zonal circulation indexes of the Eurasian and American sectors; the relationship of m monthly temperature anomalies (positive and negative) to circulation indexes of the Eurasian American sectors; the relationship of mean monthly temperature anomalies for the eastern type and its components to indexes of zonality, etc. Mean AT_{500} maps for days with high low values of zonal index of circulation for the American sector during eastern and meridio circulation types; the difference of mean values of geopotentials at AT_{500} for large and sm zonality in the American sector during eastern and meridional types; deviation of frequency anticyclones from the normal during high and low values of the zonal index in the Ameri sector, etc., are given. It is shown that during intensified zonality in the American sector, ridge aloft characterizing the eastern and meridional circulation type develops intensely and isohypses over European U.S.S.R. acquire a marked meridional direction so that the propaga of cold Arctic masses to the latitudes of the Caucasus is promoted. In addition, very low t peratures are observed here. In the case of a weakened zonality over the American sector, ridge aloft is less developed; the AT_{500} isohypses over European U.S.S.R. acquire a more z direction than in the first case. Consequently warm air masses arise over European U.S.S from the eastern Atlantic, and higher temperatures are observed over southeastern U.S.S *Subject Heading:* **1. Atmospheric circulation—temperature anomaly relationships.**—*I.L.D. author's abstract.*

Distribution Of Elements Including Air Masses (551.513.2)

12N–179 551.5

U. S. Air Weather Service, **Example of easterly wave analysis in the Western Pac July 8–10, 1945.** Its *Technical Report,* No. 105-75, March 1951. 11 p. charts (fold.) Photos **DWB**—Analysis based on surface and aircraft reports for Western Pacific, using situation July 8–10, 1945, as typical of the series of deep easterly waves which passed Guam. An unbro series of easterly waves passed Guam during May, June, July, and Aug., embedded in the east current extending to 55,000 ft. Wind, cloud and weather data furnish the main basis for analy Streamlines of wind at low levels are used in place of isobars. *Subject Headings:* **1. East wave analysis 2. Western Pacific 3. Guam.**—*M.R.*

12N–180 551.513.2:551.5

Blackadar, Alfred K., **The low-level jet phenomenon.** *Institute of the Aeronautical Scien Preprint,* No. 519, [1956?] 15 p. 8 figs., 8 refs, 6 eqs. Photostat of typescript. **D** (629. 1308 159p)—The term "low level jet" is used to denote the sharp maximum of the v profile which often develops at an elevation of less than 5000 ft above the ground. It is developed at night, and the wind speed maximum usually occurs at the top of the noctu inversion. When the frictional restraint imposed by the daytime mixing is released by the for tion of a surface inversion, the air begins to execute an inertia oscillation. Within the grow inversion the motion is partially suppressed by a downward loss of momentum, but above the version the motion is nearly frictionless. The oscillation results in supergradient winds du the latter part of the night and usually a noticeable reduction of speed before dawn. In the developed examples there is a decrease of pressure gradient with height. The extreme wind s which tends to result beneath such inertia oscillations is an important factor in explaining upward growth of the nocturnal inversion. The low level jet also plays a prominent role in formation of nocturnal thunderstorms by providing a nocturnal increase of low level converg and warm advection. *Subject Headings:* **1. Low level jet stream 2. Nocturnal tempera inversions 3. Nocturnal thunderstorms.**—*Author's abstract.*

12N–181 551.5

Hawkins, Harry F., Jr. (*Extended Forecast Sect., U. S. W. B., Wash., D. C.*), **The wea and circulation of October 1956, including a discussion of the relationship of mean 700**

ight anomalies to sea level flow. *Monthly Weather Review,* Wash., D. C., 84(10):363–370, t. 1956. 9 figs., 15 refs. **DWB, DLC**—Unusual features of Oct. 1956 weather in the U. S. e brought out in a series of weekly temperature, precipitation and flow (pressure) charts, are scussed. The main feature of the article is the discussion of the reality of mean anomaly charts: e author demonstrates that in spite of theoretical objections, the actual anomalous flows corre- ond very nicely with the mean anomaly pressure (and flow) patterns since it takes a strong omalous flow to produce an anomalous height or pressure effect. Another feature is the low a surface temperatures in the Caribbean and Atlantic during Oct. 1956. This seems to explain e lack of hurricanes in a month when the 700 mb pattern seemed favorable for development of rricanes in the Caribbean–Florida area. *Subject Heading:* **1. Anomalous circulation patterns.** *M.R.*

12N–182 551.513.2:551.557.5

Gherzi, Ernest, **Note on the formation of the westerly jet stream in the Northern Hem- here.** *Bulletin de Géophysique,* Montreal, No. 1:5–7, March 1957. 2 refs. **DWB**—The sterly jet stream is interpreted as a "compression ripple" built up by the rotational force of the mosphere, and distributing an equal amount of atmospheric mass north and south of the standard essure altitude levels. Seasonal expansions and contractions of these masses of air will modify e position of the jet stream. The presence of an easterly jet stream in July over subtropical gions does not seem to contradict the proposed hypothesis. *Subject Headings:* **1. Jet stream rmation 2. Northern Hemisphere.**—*G.T.*

12N–183 551.513.2:551.588.2:551.577.32

Arkhangel'skiĭ, V. L., **O genezise atmosfernykh osadkov v raĭone Sikhote-Alinia i kruzhaiushcheĭ ego mestnosti.** [Genesis of precipitation in the Sikhote Alin' region and ighboring areas.] *Dal'nevostochnyĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, rudy,* No. 3:68–83, **1958.** 2 fig., 2 tables, 19 refs., charts. **DWB**—An attempt was made to termine the role of topography and of atmospheric circulation in the formation of the total onthly and annual precipitation pattern of the Sikhote Alin region and neighboring areas. The fect of western cyclones and typhoons coming from the Sea of Japan is taken into account. was found that the total annual precipitation is evenly distributed at any specific altitude, which cilitates the charting of the mean total annual precipitation while taking into account the con- tions of topography, and altitude. *Subject Headings:* **1. Precipitation rates 2. Precipitation— titude relationships 3. Sikhote Alin Region, U.S.S.R.**—*S.N.*

12N–184 551.513.2:551.510.52

Namias, Jerome (*U. S. W. B., Wash., D. C.*), **The general circulation of the lower tropo- here over Arctic regions and its relation to the circulation elsewhere.** (In: Polar Atmos- ere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 1, Meteorology Section.** N. Y., ergamon Press, **1958.** p. 45–61. 11 figs., 20 refs.) Also issued in: *Journal of Atmospheric d Terrestrial Physics,* London, Special Supplement, Pt. 1, **1957.** p. 45–61. **DWB, DLC**—A w series of mean charts constructed for Jan., April, July and Nov. 1948–55, are compared with rlier estimates of the general circulation in Polar regions and particularly with more recent arts published by the U. S. Weather Bureau. While there are significant differences, they do t for the most part alter the large scale aspects of the patterns presented in the recent estimates r for that matter, the gross features of sea level normals published by BAUR almost 30 yrs ago. ie major differences of the 1948–55 mean charts form the earlier U. S. Weather Bureau normals pear to be: 1) an increase of the order of a few mb in sea level and midtropospheric pressures Jan., April and Nov. over the Davis Strait-Baffinland-Greenland area; 2) a decrease in sea vel and upper level pressures of 1–4 mb in the center of the Polar Basin for all 4 months ana- zed; 3) a greater tendency during the nonsummer months for the Aleutian Low to be split into o cells (one off Kamchatka and the other in the Gulf of Alaska), with the corresponding iergence of an additional trough in the planetary circulation. An attempt is made to decide iether these differences represent errors in the earlier normals or whether they are transitory matic fluctuations. Relationships between the Arctic and the complete hemispheric circulations e described, with special emphasis on the interactions attending the development of deep winter rctic cyclones and the apparently interdependent deep summer Arctic cyclones. *Subject Head- gs:* **1. General circulation 2. Arctic air circulation 3. Lower troposphere 4. Northern emisphere 700 mb charts 5. Arctic.**—*From author's abstract.*

12N–185 551.513.2:551.515

Okamoto, M. (*Met. Training School, J.M.A. Kashiwa*), **A statistical method for finding the day mean optimum wave length over a specified latitude circle.** *Geophysical Magazine,*

Tokyo, 28(4):443–448, Sept. 1958. 4 figs., 11 refs., 7 eqs. **DWB, DLC**—To obtain the si nificant wave length on the scale of seasonal variation in upper westerlies, a statistical optimu wave length is determined by making use of the spectrum analysis recently developed in oceano raphy. An empirical relationship between amplitude and optimum wave length is obtained, a the seasonal variation of optimum 5-day mean wave lengths at 500 mb level is discussed. *Subje Heading:* **1. Waves in the westerlies analysis.**—*Author's abstract.*

12N–186 551.513

†van Loon, H. and Taljaard, J. J., **Study of the 1000–500 mb thickness distribution in t Southern Hemisphere.** *South Africa. Weather Bureau, Notos,* 7(3/4):123–158, **1958.** 16 fig 3 tables, 16 refs. **DWB**—Monthly mean 1000–500 mb thickness maps and derived geostroph thermal wind and isanomalous maps are presented. The notable characteristics of the summ maps are a zone of weak gradient over the Antarctic Ocean and a circumpolar belt of stro gradient between approximately 40 and 50°S. The gradient in this belt decreases slightly fr summer to winter, but in subtropical and Polar regions the gradients increase markedly in t colder seasons, leading to a belt of strongest thermal winds encircling the hemisphere betwe 25° and 35°S and another over the Australian and Pacific sectors of the Antarctic Ocean. T range of thickness in the Southern Hemisphere is only one half to one third of that in the Northe Hemisphere; the maximum is found over Australia. Circumpolar belts of high and low ran alternate in the Southern Hemisphere, the range being low in the tropics and the west wind be and high in the subtropics and the Antarctic. It is found that the Northern Hemisphere annu mean values of thickness are somewhat higher than those of the Southern Hemisphere in the regi equatorward of the 60th parallels and considerably higher polewards. *Subject Headings:* **1. Thic ness charts 2. Southern Hemisphere circulation.**—*Author's abstract.*

12N–187 551.513.2:551.557

Vorob'ev, A. G., **Struinye techeniia.** [Jet streams.] *Priroda,* Moscow, No. 8:83–85, Au **1958.** 2 figs. **DLC**—The jet streams are intimately associated with the general atmosphe circulation; a large part of the kinetic energy of the atmosphere is concentrated in them. Tw fundamental types of jet stream have been observed, namely the frontal and nonfrontal. T frontal jet streams are associated with fronts extending far aloft when large gradients of temper ture and pressure occur. The maximum wind velocity, on the basis of the theory of thermal wi is attained immediately below the tropopause; above it the velocity drops sharply. The jet strea are associated with cyclones since the latter are indissolubly connected with fronts. At the ea stages of a wave and young cyclone, the axis of the jet stream is parallel to the line of the fro at the surface of the Earth and is situated several hundred km to the left of the front. At t later stages of cyclogenesis the axis of the jet stream lies south of the cyclonic center, and at t final stage the jet stream branches. Intense cyclonic activity is accompanied usually by large wi velocities in the jet stream region. During the North Sea storm of Jan. 1953, which caused t great floods in Great Britain and in the Netherlands, the jet stream axis extended from Engla to the Black Sea; wind velocities of 300 km/hour were recorded. Of the nonfrontal jet strea the subtropical jet stream having a westerly direction, has been studied most; it is observed b tween 20 and 35°N lat. at 12–14 km altitude and it often girdles the entire Earth. Its flow a direction are more stable than those of the jet streams of moderate latitudes. In summer, su tropical jet streams are localized and their wind velocity is low. *Subject Headings:* **1. Jet strea 2. Frontal jet stream 3. Jet stream formation.**—*I.L.D.*

12N–188 551.513.2:551.553.21:551.524.2(57

Arkhangel'skiĭ, V. L., **O vliianii Sikhote-Alinia na teplovoe sostoianie nizhneĭ polovi troposfery v 1-iu i 2-iu fazy letnego mussona.** [Influence of the Sikhote Alin' Range on therm conditions in the lower troposphere during the first and second phases of the summer monsoo *Dal' nevostochnyĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy,* No. 3:84–8 **1959.** 3 figs., 4 refs. **DWB**—The charts of the typical summer monsoon circulation (anticyclo over Western Siberia, cyclone over the Kuril or Aleutian Islands) exhibited closely spaced i therms in the region of Sikhote Alin as a consequence of the complex influence of the mount range and seashore. In the case of typical isotherms of the winter monsoon circulation over t lowlands near the Ynisei River and the western part of the Bering Sea, closed heat sources we revealed. Mean monthly charts for Dec., Jan. and Feb. show a warm crest coming from the sou *Subject Heading:* **1. Orographic effects on tropospheric temperatures.**—*S.N.*

12N–189 551.513.2(98,99) 551.513.2:551.509.318(98,9

Girs, A. A., **O vzaimosviazi mezhdu tsirkuliatsieĭ atmosfery v Arktike i Antarktike.** [lationship between the atmospheric circulation in the Arctic and the Antarctic.] *Leningr*

ktícheskiĭ i Antarkticheskiĭ Nauchno-Issledovatel'skiĭ Institut, Informatsionnyĭ Biulletin' Sovet-ŏĭ Antarkticheskoĭ Ekspeditsii, No. 2:21–24, **1958.** 17 refs. **DWB** (P 2:1958)—The methods long range weather forecasting, described by various authors, are reviewed together with the hor's comments relating to general regularities in the atmospheric circulation. Weather fore-ting must be based on these regularities existing in both Northern and Southern Hemispheres. e synoptic processes in the Arctic are closely related to the atmospheric circulation in the North-n Hemisphere, particularly to the meridional processes. In a similar manner, the variations of microsynoptic processes above the Southern Hemisphere are related to the synoptic processes the Antarctic. The analysis and comparison of both relationships lead to the conclusion that variations of the characteristics of synoptic processes in the Arctic and Antarctic are sub-ntially similar to the microsynoptic processes in the Northern and Southern Hemispheres. *Sub-t Headings:* **1. Atmospheric circulation 2. Arctic 3. Antarctica.**—*N.P.S.*

12N–190 551.513.2:551.511.6

†Pfeiffer, H., **Calculations of "Austausch" coefficients for the Southern Hemisphere and marks on the suitability of some circulation indices.** *South Africa. Weather Bureau, Notos,* 3/4):159–169, **1958.** 8 figs., 3 tables, 12 refs. 2 eqs. **DWB**—Austausch coefficients, calcu-ed according to Wagner's and Lettau's formulas, are presented for the Southern Hemisphere. e seasonal and spatial variations of the coefficients and their usefulness as indicators of the neral circulation are discussed. A comparison is made with other circulation indicators, such the zonal and meridional indices and other combined indicators which quantitatively describe the ensity of the general circulation. A combined zonal index which includes the effects of both westerlies and subtropical easterlies is found to be particularly suitable for the purpose. *Sub-t Headings:* **1. Southern Hemisphere circulation 2. Austausch coefficient.**—*Author's abstract.*

12N–191 551.513.2:551.557.5:551.577.37

Richter, Donald A. and Dahl, Roy A. (*U. S. W. B.*), **Relationships of heavy precipitation the jet maximum in the Eastern United States, September 19–21, 1958.** *Monthly Weather view*, Wash., D. C., 86(9):368–376, Sept. **1958.** 10 figs., 10 refs. **DWB, DLC**—During Sept. –21, 1958, precipitation, which had been occurring in rather large amounts over the western lf States, began spreading northeastward through the Ohio River Valley without benefit of any rked surface cyclogenesis. This paper analyzes the relationship between the rainfall pattern d the progression of wind maxima along the jet. In addition, the paper investigates a semi-jective method for 24-hr quantitative precipitation forecasting, using vertical motion charts of e Joint Numerical Weather Prediction (JNWP) Unit. This method of quantitative precipita-n forecasting was developed on an experimental basis by GILMAN et al. and has been adopted the National Weather Analysis Center (NAWAC) with some modifications aimed at reducing e time consumed in lengthy computation. *Subject Headings:* **1. Jet stream maxima 2. Jet eam-heavy rainfall relationships 3. Objective precipitation forecasting 4. Eastern United ates.**—*Author's introduction.*

12N–192 551.513.2:551.557.5

§†Serebreny, Sidney M.; Wiegman, Eldon J. and Hadfield Rex G., **Study of jet stream condi-ns in the Northern Hemisphere during spring.** Pan American World Airways Inc. Meteorol-y Dept., Contract N600(188)-44188, Technical Report, No. 7, June **1958.** 86 p. 34 figs., 2 les, 12 refs., appendix of tables. Oversize. **DWB** (M57.2 P187st No. 7)—This is companion as to that prepared by the Pan American Airways Met Dept. in 1957 for the U. S. Navy eather Research Facility for the winter and summer seasons, respectively (Report No. 5 & 6). in the other reports, this collection of maps and data consists of a discussion of jet stream currences in the Northern Hemisphere N of lat. 50° by months and seasons, in this case for arch, April and May. Pt. 2 comprises the bulk of the report and includes a variety of charts owing mean and actual cases of 500 mb jet stream locations, 500 mb topography charts, type arts for blocking in various sectors and statistical diagrams. *Subject Headings:* **1. Jet stream ases 2. Jet stream climatology 3. Synoptic case history studies 4. Northern Hemisphere.** *M.R.*

12N–193 551.513.2:551.557.2:912

§Serebreny, Sidney M.; Wiegman, Eldon J. and Hadfield, Rex G., **Study of jet stream con-ions in the Northern Hemisphere during fall.** Pan American World Airways, Inc. Mete-ology Dept., Contract N189(188)-39691A, Technical Report, No. 8, Dec. **1958.** 87 p. 35 figs., refs., appendix of tables. Oversize. **DWB** (M57.2 P187st)—Data for 1947–56 for the North-n Hemisphere (north of 50°N lat.) for Sept., Oct. and Nov. are compiled on charts to illustrate streams associated with 8 types of blocking in various latitudes; their frequencies and direction

frequencies in different latitudes and seasons are shown in graphs and tables and on a Polar cha for squares 10° long. by 5° lat. Charts are presented for 500, 300 and 200 mb, showing (on 3 mb chart), by heavy blue bands, the jet streams superimposed on typical synoptic charts for th several types, plus composite charts of trajectories for the same types, etc. (For abstract on th authors **Study . . . during summer,** *see* 9.7–32, July 1958, *MAB.*) *Subject Headings:* **1. J stream atlases 2. Blocking action frequencies 3. Upper level charts 4. Northern Hem sphere upper level charts 5. Northern Hemisphere.**—*M.R.*

12N–194 551.513.2:551.557.5:629.1

Baroni, Andrea, **Corrente a getto e navigazione aerea.** [Jet stream and air navigation] *Rivista di Meteorologia Aeronautica,* Rome, 19(3):47–49, July/Sept. **1959.** fig. **DLC**—In i 1957 **Annual Report,** the Smithsonian Institution included an article on the jet stream by R. L (p. 293–302), which proved to be of great interest. In this paper, BARONI presents a résumé concepts of the jet stream, which first appeared about 1933 with the work of BJERKNES, SOLBE and BERGERON, and which were further developed by WILLETT at Massachusetts Institute of Tec nology (1944). Since that time, studies on the jet stream have been intensified and almost all the principal meteorological services of the world are concerned with it. A vertical section of th jet stream at 10°E Greenwich is shown. Air navigation must indeed be prepared to encount turbulence in the neighborhood of the jet stream. *Subject Headings:* **1. Jet stream 2. A navigation.**—*E.Z.S.*

12N–195 517.512.2:551.513.2:551.5

Boville, B. W. and Kwizak, M., **Fourier analysis applied to hemispheric waves of th atmosphere.** *Canad. Meteorological Branch,* CIR-3155, TEC-292, Jan. 27, **1959.** 21 p. 8 figs 3 tables, 3 refs. **DWB, DLC**—The mathematical concepts involving the application of Fouri analysis are reviewed very briefly. The addition of waves of different wave numbers is illustrat on a Polar diagram. The similarity to physical reality is evident although no physical interpret tions are attempted. Finally, examples of 500 mb charts resolved into separate wave numbe are presented and the method of computation is included in the appendix. *Subject Heading* **1. Fourier analysis of hemispheric waves 2. Hemispheric wave numbers.**—*Authors' abstra*

12N–196 551.513.2:551.557

Chambers, E. (*British Overseas Airways Corp.*), **The jet stream.** *Institute of Navigatio London, Journal,* 12(3/4):266–288, July/Oct. **1959.** 11 figs., 12 refs. **DWB, DLC**—Original presented in London on Nov. 25, 1958 at a meeting of the Guild of Air Pilots and Air Navigator this paper discusses the structure and the likely locations of jet streams. Jet streams may occ in almost any latitude but are comparatively rare within the tropics (20°N to 20°S), while higher latitudes they oscillate and recurve within wide limits. Later, from the point of view aviation, wind shear in the jet stream region and clear air turbulence phenomena are examine In a discussion of the relationship between cloud formations and jet stream locations, the value cloud observations in locating the jet core is indicated. It is pointed out, however, that for a accurate forecasting of jet streams, a dense network of upper wind reporting stations is require Finally, the paper considers the in-flight aspects and makes a number of recommendations f flights in jet stream regions. *Subject Heading:* **1. Jet stream.**—*I.S.*

12N–197 551.513.2:551.557.5:0

Dunay, Sándor, **A futóáramlas.** [The jet stream.] *Hungary. Orszagos Meteorolog Intezet, Hivatalos Kiadvanyai,* No. 22:85–87, **1959.** Hungarian and English summaries p. 2 **DWB** (M(08) H936be)—A brief review of the literature on the jet stream, covering the peri 1944–1956. To aid research the author suggests the extension of the observational networ *Subject Heading:* **1. Jet stream bibliographies.**—*E.K.*

12N–198 551.513.2:551.515.8:551.43(

Il'inskiĭ, O. K., **K voprosu o severnoĭ vetvi zonal'nogo perenosa nad Aziei v Zimnii perio** [The northern branch of the zonal current over Asia in winter.] *Meteorologiia i Gidrologi* Leningrad, No. 8:13–15, Aug. **1959.** fig., 11 refs. **DWB, DLC**—The accepted notion that t existence of two main zones of westerly transport in winter over Central Asia is a result of t mechanical action of mountain systems is challenged. An AT_{500} map showing the typical positi of the principal frontal zones over Asia in Jan. 1957 is presented and analyzed. On the basis this analysis, a consideration of the branching of the westerly flow over Europe, etc., the auth shows that the mountain massif of Central Asia is primarily a factor preventing the confluence two branches of the westerly current over Asia and producing disturbances in the northerly branc and only secondarily increasing the baroclinicity of the atmosphere in the northern and southe zones. *Subject Headings:* **1. Zonal currents 2. Asia.**—*I.L.D.*

12N–199 551.513.2:551.515.7(98)

Koppány, György, **A sarki leghalmazok fölepülese és kapcslatuk az általános légkörzéssel.** e development of Arctic anticyclones and their connection with the general atmospheric circula-.] *Hungary. Országos Meteorológiai Intézet, Hivatalos Kiadványai*, No. 22:54–62, **1959.** gs., table, 8 refs. Hungarian and English summaries p 212. **DWB** (M(08) H936be)—The elopment of the winter cold poles of the Northern Hemisphere and their effect on the general ospheric circulation are dealt with. In the first part a general survey of the basic problems some selected passages from literature are given; in the second part, comparisons are made veen the two cold poles during the winter months. This part deals also with the source regions trajectories of the outbreaks of cold air. It is stated that the cold outbreaks start from the th American continent in regular intervals but during different years their trajectories may r from one other. *Subject Headings:* **1. Arctic anticyclone circulation 2. Anticyclones.** *uthor's abstract.*

12N–200 551.513.2:551.557.5:551.579.4:551.577.38(540)

Koteswaram, P. (*Met Off., New Delhi*), **Some aspects of the aerology of floods and ughts in India during the southwest monsoon season.** (In: Symposium on Meteorological Hydrological Aspects of Floods in India, New Delhi, April 1958, **Proceedings.** Delhi, Indian eorological Dept., **1959.** Summary. p. 52.) **DWB** (M79.4 S989pr)—The importance of litions in the upper troposphere in the causation of floods and droughts over India in the south- monsoon season is discussed. It is pointed out that the superposition of upper divergence ssociation with easterly waves or jet streams as well as traveling vortices in the high tropo- re over areas of low level convergence, are largely responsible for widespread, heavy rainfall that areas of upper convergence in association with these systems cause large scale subsidence consequent drought conditions when they persist over an area for some time. *Subject Head-*: **1. Upper troposphere-rainfall relationships 2. Upper troposphere-drought relationships** ndia.—*Author's summary.*

12N–201 551.513.2:551.557.5

Kurilova, Iu. V., **Issledovanie struĭnykh techeniĭ v Tsentral'noĭ Aerologicheskoĭ Observa-**i. [Investigation of jet streams at the Central Aerological Observatory.] Moscow. *Tsen-naia Aerologicheskaia Observatoriia, Trudy*, No. 26:56–64, **1959.** 5 tables. **DLC**—This in-igation of jet streams is related to two problems: one concerns the air currents above the tory of the U.S.S.R.; the second, flight conditions and types of turbulence connected with rent aerological characteristics and stratification in the jet stream. The investigation of the rosynoptic characteristics was based on the results of the temperature-wind soundings in the osphere, and analysis of the maps of baric topography. The methods of observation and ive results are described in detail, covering the European and Asiatic territories of the .S.R. The jet streams above the U.S.S.R. are the result of complicated and variable aero-ptic processes and they are created by the intensification of the VFZ. The intensification of VFZ and various positions of the axis during different seasons are discussed in detail, with lated data on characteristics and values of various coefficients. Special attention is given to condition of "bumpy air" due to the jet stream and turbulence in the upper and lower tropo-re. Cloud characteristics are also considered in the discussion. *Subject Headings.* **1. Jet am research 2. U.S.S.R.**—*N.P.S.*

12N–202 551.513.2/3(7)

O'Connor, J. F. (*Extended Forecast Sec., U. S. W. B., Wash., D. C.*), **The weather and cir-tion of Sept. 1959: Quasi-periodic oscillations in zonal index and centers of action.** *thly Weather Review*, Wash., D. C., 87(9):357–365, Sept. **1959.** 8 figs., ref. **DWB, DLC** he paper traces the index cycle during the 4 weeks in Sept. The chief features during this od are: the first week, a high index; the second, an amplification and retrogression of the e scale waves in the westerlies; the third, an amalgamation of anticyclones over Canada; and fourth, attenuation and progression of the large scale waves in the westerlies. Hurricanes typhoons in the Atlantic and the Pacific are also reported. *Subject Headings:* **1. Zonal index ndex cycles 3. North America.**—*I.S.*

12N–203 551.513.2:551.515.8(439.1)

Pápai, Gabriella (*Szalay*), **Légáramlás Magyarországon kétoldali hidegbetörés esetén.** nospheric circulation over Hungary in the case of cold air invasion from two sides.] *Időjárás*, apest, 63(6):356–360, Nov./Dec. **1959.** 3 figs., table, 5 refs. Hungarian and German sum-es p. 356. **DWB, DLC**—The vertical extension of the effect of changing circulation over the hern Carpathians is examined, namely in a macrosynoptic situation in which an anticyclone

lies north of Hungary, the steering current therefore being directed N-NE. On the basis of wind vectors of the individual contours, it can be confirmed that the effect of the changing culation does not extend above 1.5 km. *Subject Headings:* **1. Atmospheric circulation chan 2. Carpathian Mountains.**—*Transl. of author's abstract.*

12N–204 551.513.2:551.557.5(4

Papinashvili, K. I., **Raspredalenie struĭnykh techeniĭ v atmosfere nad territorieĭ Za vkaz'ia.** [Jet stream distribution in the atmosphere over Transcaucasia.] *Tiflis, Nauch Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy,* No. 4:3–17, **1959.** 3 figs., 7 tables refs. **DWB**—This study on the jet stream over Transcaucasia contains the following: the ae climatic characteristics of Transcaucasia including wind regime, temperature regime, and positi of the principal isobaric surfaces, the synoptic aerological condition of the jet stream and so physical features of jet streams over Transcaucasia. The Transcaucasian jet streams are as ciated with sharp temperature contrasts and tropospheric discontinuity, indicating cold air incurs and the formation of a deep trough aloft over the European territory of the U.S.S.R. and Cauca The prevailing direction of the jet stream over Transcaucasia is W-SW, S-SW and SW especial Transcaucasia varies on the average between 10 and 12 km. The heights of individual jet strea above their axes and any between 140 and 180 km/hr although over central Caucasia (the pr cipal Caucasian range) they may attain higher values. The width of the jet stream zone is on average 240 km although over the principal Caucasian range it may be compressed somewhat. T thickness of the jet stream zone is 2–4 km. Four fundamental types of jet streams have b established: the first type contains two sub types. Each type is characterized by specific frequen thus the processes of the first type have their maximum frequency in fall-winter and partially summer; the processes of the second type in fall and summer; the processes of the third type spring, and of the fourth type in winter. *Subject Headings:* **1. Jet stream distribution Transcaucasia, U.S.S.R.**—*I.L.D.*

12N–205 551.513.2:551.557.5:551.579.4(541

Ramaswamy, C. (*Regional Met. Centre, Madras*), **On jet stream waves and their role in development of floods in Assam during the pre-monsoon period.** (In: Symposium on Me orological and Hydrological Aspects of Floods in India, New Delhi, April 1958, **Proceedin** Delhi, Indian Meteorological Dept., **1959.** Summary p. 52.) **DWB** (M79.4 S989pr)—During premonsoon months, the state of Assam occasionally experiences very heavy convective rain which leads to floods in that state. The months of April and May 1954 were characterized b large excess of rainfall in Assam which led to floods in that state in May 1954. These months, the other hand, were characterized by very deficient thunderstorm rain over the rest of north India. The daily synoptic situations over the Asiatic continent during these two months h been examined. The monthly mean 700 mb contours and anomalies over Asia and nearby ar have also been studied. It has been shown that the upper divergence associated with the wa in the westerly jet stream profoundly influence the development of heavy rainfall leading to flo in Assam. The increase in the moisture content of the air over Assam with the advance of premonsoon period and its importance in the increase of rainfall have also been discussed. It further been shown that as the characteristics of the jet stream waves affecting Assam are clos linked with large scale hemispheric perturbations, it is very important to study the high level f patterns not only over India but also over the countries to the north of this subcontinent for fo casting rainfall leading to floods in Assam in the premonsoon period. *Subject Headings:* **1. Lo range flood forecasting 2. Jet stream-flood relationships 3. Assam, India.**—*Author's s mary.*

Centers of Action (551.513.3)

12N–206 551.513.3:551.515

Wuest, Willys D. (*Weather Forecasting Research Center*), **An investigation of the existe of an Aleutian low singularity.** Chicago. Univ. Dept. of Meteorology, Contract AF 19(60 2179, Technical Report No. 6, Aug. **1958.** 12 p. 4 figs., 9 refs., 2 eqs. **DWB**—The normal day isobaric charts prepared by Lahey, Bryson and Wahl (1957) and the daily synoptic ch published by the U. S. Weather Bureau were used to investigate the development of a ma singularity in the pressure field which occurs in spring over the northern part of the Pacific Oc The cyclone frequency and the cyclone activity were evaluated from the daily synoptic charts, it was found that a major change in cyclone activity takes place in early April. The soca Aleutian Low then divides itself into two centers, one in the Gulf of Alaska and the other o eastern Asia. The analysis confirms and adds details to the results obtained by Lahey, Bry and Wahl, who used normal pressure charts. *Subject Headings:* **1. Aleutian Low 2. Pac Ocean.**—*Author's abstract.*

Relations Between Distant Regions (551.513.7)

12N–207 551.513.7:551.509.311

§Kawazoe, N., **On a foregoing phenomenon of "blocking" in neighborhood of Japan.** *rnal of Meteorological Research,* Tokyo, 5(6):475–480, July **1953.** 3 figs., 6 refs. In panese; English summary p. 475. **DWB**—From an analysis of weather maps (1951–1952), author finds that an antecedent to blocking in the neighborhood of Japan is the appearance an isolated warm high over the region from Kamtchatka or the Aleutians to Alaska, and that s warm high is due to an abnormally developed depression. This low is formed in a lower itude (< 30°N) near Japan (by a strong outbreak of cold air, etc.) and moves almost due east, ing a course at a much lower latitude than the normal path. As the northern Pacific High is engthened at this time, it is separated and its upper portion pushed to a northern latitude. For ypical case the weather maps of upper (700 mb) and surface layers from the middle to the t decade of March 1952 are presented. A physical interpretation of the phenomenon is proposed. *bject Headings:* **1. Blocking action 2. Synoptic analysis 3. Pacific High 4. Japan.**— *thor's abstract.*

12N–208 551.513.7(75)

Winston, Jay S. (*U. S. W. B., Wash., D. C.*), **Weather and circulation of March 1955: a nth of extreme heat and cold over the United States.** *Monthly Weather Review,* Wash., C., 83(3):72–77, March **1955.** 6 figs., 6 refs. **DWB**—Weather was generally cold in N and and warm in S and E of U. S. in March, and variability was great throughout the month in ny sections. Troughs and ridges were displaced 20° to 25° long. west of usual position, placing ridge over the Gulf of Alaska, an unusual position. A cold wave during the 4th week, follow- unusually warm weather in SE, caused a great deal of damage to fruit and vegetable crops as south as the Gulf Coast. In general the precipitation was subnormal owing to NW flow dominating. An extreme 1000-700 mb thickness anomaly of — 310 ft occurred over W Canada h subnormal thickness extending to NW U. S. *Subject Headings:* **1. Monthly circulation omalies 2. Cold wave, Southeastern United States, March 1955 3. Southeastern United ates.**—*M.R.*

12N–209 551.513.7:551.515.2

Andrews, James F. (*Ext. Forecasting Sec., U. S. W. B., Wash., D. C.*), **The weather and culation of August 1956: marked reversal in hurricane activity from August 1955.** *Monthly eather Review,* Wash., D. C., 84(8):305–311, Aug. **1956.** 9 figs., table, 7 refs. **DWB, DLC**— ly one hurricane ("Betsy") came near the east coast of the U. S. during Aug. 1956, compared h 3 in Aug. 1955. This was believed to be due to a southward movement of the zone of the sterlies at 700 mb. In years of maximum hurricane activity, the belt of westerlies is displaced ll to the north. Comparison of Aug. 1956 700 mb heights with those for Aug. 1955 shows a rked drop in height of 610 ft over NW Europe (anomaly of — 360 ft). This is the 3rd great- anomaly since 1933 for any Atlantic or European area. As a result, the weather was unusually l and rainy in the British Isles and most of Europe, compared with warm dry weather in Aug. 55. In the U. S., on the other hand, weather was very dry, especially in the SW and SE tes, though it was cool and wet from New England to the Pacific Northwest. *Subject Head- s:* **1. Atmospheric circulation anomalies 2. Hurricane "Betsy" (1956).**—*M.R.*

12N–210 551.513.7

Woffinden, C. M. (*U. S. W. B., Wash., D. C.*), **The weather and circulation of March 1956: month with a marked progression of weekly temperature and circulation anomalies.** *nthly Weather Review,* Wash., D. C., 84(3):108–115, March **1956.** 8 figs., 3 tables, 10 refs. **WB, DLC**—The dominant characteristic of the mean circulation for March 1956 was a "rigorous clone vortex, which became established over the Polar basin early in the month," and produced largest 700 mb anomaly (— 520 ft) observed on the mean chart. Strong zonal westerlies verned the circulation, averaging 12.1 mps (3 mps above normal) for the month. A reversal planetary wave pattern occurred about midmonth and it was the result of a fairly regular east- rd motion of most 5-day circulation components. The temperature and precipitation associated th the planetary waves are analyzed and the Alaskan cold is discussed. *Subject Headings:* **1. mospheric circulation anomalies 2. Temperature anomalies 3. Cyclonic vortexes.**—*I.L.D.*

12N–211 551.513.7

Green, Raymond A. (*U. S. W. B., Wash., D. C.*), **Weather and circulation of Aug. 1957.** *nthly Weather Review,* Wash., D. C., 85(8):282–287, Aug. **1957.** 9 figs., table, 8 refs. **DWB, LC**—Marked persistence from July–Aug. was noted in circulation patterns in midlatitudes.

Drought was relieved in East during week ending Aug. 26. Only one tropical storm, "Berth was reported in Gulf and none in Atlantic. *Subject Headings:* **1. Atmospheric circulatio anomalies 2. Drought relieving storms 3. United States.**—*M.R.*

12N–212 551.513.7:551.543

†Hofmeyr, W. L., **Diurnal and semidiurnal oscillations of surface pressure in tropic regions.** *South Africa. Weather Bureau, Notos,* 7(1/2):6–20, **1958.** 4 figs., 2 tables, 24 ref 4 eqs. **DWB**—Harmonic analysis of hourly surface pressures for a representative distribution tropical and subtropical stations reflects the known connection of diurnal amplitudes with latitu and distance from the sea, and of semidiurnal amplitudes with latitude, height above sea lev and season of the year. Semidiurnal atmospheric oscillations are, in fact, composed of pronounc wandering and lesser known standing waves. In the discussion of the results, special mention made of the latter waves which evidently have their greatest effect in the tropics over southe India, somewhat north of the equator and also somewhere off the west coast of South Americ A case study of the effect of the regular diurnal and semidiurnal oscillations on a chosen synopt chart, proved that their elimination cannot be of any material concern to the analyst. *Subje Headings:* **1. Pressure oscillations 2. Tropical regions.**—*Author's abstract.*

12N–213 551.513.7:551.543

Berlage, H. P. and De Boer, H. J., **On the extension of the southern oscillation throug out the world during the period July 1, 1949 to July 1, 1957.** *Geofisica Pura e Applicata,* Mila 44:287–295, Sept./Dec. **1959.** 2 figs., 15 refs. **DLC**—The southern oscillation in air pressu may be described primarily as an air pressure balance whose scales are centered near Djakar (Indonesia) and near Easter Island (South Pacific Ocean), respectively. A synoptic station w established at Easter Island July 1, 1949. 1) The eight 12-monthly air pressure values of Djakar and Easter Island from the period July 1949 up to July 1957 have been correlated with the simu taneous air pressure values at 289 stations throughout the world. 2) The seven 12-monthly a pressure values of Djakarta and Easter Island from the period July 1949 up to July 1956 ha been correlated with the simultaneous air pressure values at 65 grid points in North Asia, and fro the period July 1956 up to July 1957 with simultaneous air pressure values at 32 grid points Africa. 3) At least five 12-monthly air pressure values of Djakarta and Easter Island have be correlated with simultaneous air pressure values at 159 grid points between latitudes 20° and 60° (Southern Hemisphere Project, Weather Bureau, Pretoria). The latter coefficients obtained, bei less reliable, have been used only indicatively. The 545 correlation coefficients have been plott on world charts and isopleths of the correlation coefficients, with the values -0.9; -0.7; $-0.$ 0; $+0.4$; $+0.7$ and $+0.9$, have been drawn. The patterns of the isopleths on both maps a very much alike. This is due of course, to the fact that the coefficient of correlation betwe Djakarta and Easter Island air pressure deviations reaches a value as high as -0.93. From the pictures may be inferred that the southern oscillation acts for the greater part as a stationa wave and for the rest as a progressive wave. Another prominent feature of the southern oscil tion, shown by the pictures, is that the Easter Island scale is meridionally developed, whereas t Djarkarta scale is mainly zonally developed, especially along the equator. It is shown to be ve probable that the Arctic and Antarctic regions both cooperate with the Djakarta region, th stressing an undeniable overall zonal symmetry of the two patterns. A first impression is obtain of the kind of encroachment of the Antarctic circulation on the southern oscillation. The w detailed patterns in the northern moderate and high latitudes recall the planetary waves in t zonal current, which normally flows through these latitudes and the question is raised wheth blocking action is stimulated when the southern oscillation is well developed. Similar indicatio are obtained from the still rather provisional and rough patterns in the southern moderate and hi latitudes. *Subject Headings:* **1. Pressure balance 2. Southern oscillation 3. Indonesia South Pacific Ocean.**—*Author's summary.*

PART C. ATMOSPHERIC DISTURBANCES (551.515)

WEATHER, ATMOSPHERIC FORMATIONS AND DISTURBANCES (551.515)

12N–214 551.511.1:551.5

*Purvis, John C. (*U. S. W. B. Airport Station, Columbia, S. C.*), **The instability line of Ju 8, 1951 in South Carolina.** U. S. Weather Bureau, April 23, **1951.** 9 p. 12 figs. (fold.), 3 re **DWB** (M15.4 U587ib)—A case study of an unusually severe instability line which struck cent S. C. during the afternoon of June 8, 1951, is discussed. Data on the movement of this instabil line, severity, and synoptic conditions both preceding and following its occurrence are present in some detail. An interesting feature of this storm is that a pressure jump apparently develop

entral S. C. several hrs after the formation of the instability line. Wind and temperature data he 850, 700, and 500 mb levels and augmented by two cross sections are presented and dis- ed in an attempt to explain the origin of this unusual storm. These data suggest that the elopment of this instability line resulted from a combination of cold advection above the 700 level and warm advection below this level within a moist air mass that was already conditionally able. *Subject Headings:* 1. **Instability line** 2. **Cyclonic storms.**—*Author's abstract.*

12N–215 551.515:551.515.4

Hader, Fritz, **Gewitter, Unwetter und Wetterlagenkalender 1952.** [Thunderstorm, bad ther and weather situation calendar for 1952.] *Austria. Zentralanstalt für Meteorologie und dynamik, Jahrbuch,* 1952, New Ser., 89:D7–D17, **1953.** 4 tables. **DWB**—Lengthy report unusual weather in each month, and summary of thunderstorm occurrences. *Subject Headings:* **tmospheric disturbances 2. Thunderstorm data 3. Austria.**—*M.R.*

12N–216 551.515:525.63

Volker, —, **La marée de tempête du 1er février 1953 et ses conséquences pour les Pays-** . [The storm flood on the 1st Feb. 1953 and the consequences for the Netherlands.] *La ille Blanche,* 8(B):797–806, Nov. **1953.** 4 figs. In French; English summary p. 797. **DLC** iscussion of the hydraulic engineering problems created by the rupture of protective structures he Netherlands, as a result of the storm tides of Feb. 1953. Several types of rupture and ion and various methods of reconstruction are described and illustrated. *Subject Headings:* **torm tide damage 2. Hydraulic engineering 3. Netherlands.**—*G.T.*

12N–217 551.515:598.2

Seilkopf, H., **Jan van Gent.** [Bass gannet.] *Wetterlotse,* No. 79:242–246, Nov. **1954.** **DLC**—The Jan van Gent (*Sula bassana*) breeds on the Bass rock. On Sept. 24, 1954, it was in the Skagerrak in upper warm S winds in front of a deep Atlantic depression. Other nples of travel of birds in unusual weather conditions are quoted. *Subject Headings:* **1. nospheric disturbances 2. Bird migrations.**—*C.E.P.B.*

12N–218 551.515

Triegaardt, D. O., **Instability lines.** *South Africa. Weather Bureau, News Letter,* No. 2–3, Oct. 31, **1954.** fig. **DWB**—Notes on line squalls in U. S. and South Africa, the latter trated by situation, are represented by charts of Jan. 20 and 21, 1954. *Subject Headings:* **nstability line 2. South Africa.**—*M.R.*

12N–219 551.515.4:92

Khrgian, A. Kh., **I. I. Kasatkin i ego raboty o grozakh i grozovykh oblakakh.** [I. I. atkin and his work on thunderstorms and thunder clouds.] *Meteorologiia i Gidrologiia,* cow, No. 3:52–55, May/June **1955.** 3 figs., 8 refs. **DWB**—A brief account of the scientific er of the Russian meteorologist, I. I. KASATKIN (1864–1941) is presented and an account of investigations of ascending atmospheric currents, thunder clouds and rainfall is given. ATKIN'S activities included studies on the velocity of ascending currents and the resulting ation of cumulus clouds; the causes of ascending currents; the effect of cumulus clouds upon ospheric stratification; the relationship between the thermodynamic structure of the atmosphere the form of its motions; the descending air movement caused by fallen rain drops; the role ain drop evaporation in intensifying ascending currents; microsynoptic studies in front in- nce; the establishment of a microsynoptic network near Moscow in 1921–22, etc. *Subject dings:* **1. Thunderstorm investigations 2. Biography of I. I. Kasatkin 3. Kasatkin, I. I.** *L.D.*

12N–220 551.515:551.513.1

Van Isacker, J. and Van Mieghem, Jacques, **De selectieve rol van de atmosferische storingen le algemene luchtcirculatie.** [Selective role of atmospheric disturbances in the general cir- tion of the atmosphere.] *Vlaamsche Academie voor Wetenschappen, Letteren en Schoone Kun- van België. Klasse der Wetenschappen, Mededelingen,* 18(1), **1956.** 18 p. fig., 2 tables, fs., 27 eqs. French and English summaries p. 16–18. **DWB, DLC**—The meridional fluxes ensible heat and angular momentum are determined by the scale of atmospheric disturbances. s scale can be defined by the number of waves along the latitude circles. An expansion into rier series is used on the basis of hemispheric weather maps. Computing machines are em- ed for this analysis. More than 80% of the meridional sensible heat transport is accom- ied by disturbances longer than 4000 km, more than 50% by disturbances in excess of 800 km. theoretical background and developments are given in detail. *Subject Headings:* **1. Atmos- ric. disturbances 2. Meridional flux 3. Northern Hemisphere.**—*A. Assur.*

12N–221 551.5

Chicago. Univ. Dept. of Meteorology, **Severe Local Storms Project.** Contract Cwb-89 Final Report. Issued **1957.** Pt. 1 (mimeo.) consists of Technical Reports, No. 1–6, April 19 Sept. **1957.** Pt. 2 (carbon of typescript), consists of 3 papers. **DWB** (M15 C532fi)—Conten Pt. 1, Technical Report, No. 1. Fujita, Tetsuya and Brown, Henry A., **Study of mesosyste and their radar echoes.** 18 p. 15 figs., 7 refs. (Also issued in: *American Meteorolog Society Bulletin,* 39(10) :538–554, Oct. **1958.** 14 figs., 9 refs.); Technical Report, No. 2. Fuj Tetsuya and Omoto, Yukio, **Analysis of airplane flight observations.** 10 p. 14 figs., 4 re (For abstract, *see* 10L–881, Suppl. No. 1, 1959, *Met. Abs.*); Technical Report, No. 3. Fuj Tetsuya, **Structure and movement of a dry front.** 9 p. 10 figs. (For abstract, *see* 10B–1 Feb. 1959, *Met. Abs.*); Technical Report, No. 4. Fujita, Tetsuya and Brown, Henry A., **Revis method of pressure reduction.** 8 p. 2 refs., 13 eqs. (For abstract, *see* 11.6–305, June 19 *Met. Abs.*); Technical Report, No. 5. Fujita, Tetsuya, **Recent studies in mesometeorolo** 6 p. 4 figs., 18 refs. (Also issued in: *Meteorological Society of Japan, Tokyo, 75th Anniversa Vol. of the Journal,* pub. No. **1957.** p. 256–261. 4 figs., 18 refs.); Technical Report, No. Fujita, Tetsuya, **Three-dimensional mesoanalysis of a squall line.** 22 p. 61 figs., 6 refs. A issued as *Illinois. Water Survey, Report of Investigation,* No. 36, **1958.** 19 p. 6 refs., 61 fi DLC (GB705.I3.A3), DWB (M13 I29re). Pt. 2 [No. 1] Newton, Chester W. and Newt Harriet Rodebush, **Behavior of large convective rainstorms, and effects of ambient wind fie** Summary only. 5 p. 4 figs. Full report, with title: **Dynamical interactions between la convective clouds and environment with vertical shear,** issued in: *Journal of Meteorolo* 16(1) :483–496, Oct. **1959.** 6 figs., 21 refs., eqs.; [No. 2] Newton, Chester W. and Katz, S **Movement of large convective rainstorms in relation to winds aloft.** 7 p. 6 figs., 9 re Also issued in: *American Meteorological Society, Bulletin,* 39(3) :129–136, March **1958.** 7 fi 10 refs. (For abstract, *see* 10.1–212, Jan. 1959, *Met. Abs.*); [No. 3] Newton, Charles Convective precipitation in an occluded cyclone. Preprint. 12 p. 14 figs., 25 refs. Issu in: *Meteorological Society of Japan, 75th Anniversary Volume of the Journal.* p. 243–255. figs., 25 refs. (For abstract, *see* 10.4–190, April 1959, *Met. Abs.*) Fujita and Brown, by us data from regular synoptic stations, analyzed 5 mesosystems occurring June 4–5, 1953, in an a 500 × 600 mi near Chicago. In Technical Report No. 1, results of this study are given. Hou precipitation amounts accompanying each system were integrated with respect to time, and "ti integrated" precipitation charts were then constructed. In Technical Report No. 2, Fujita Omoto present results of an analysis of 2 airplane observations taken over the Great Plains, M 13, 1956. Fujita analyzes aircraft observations taken in the course of 3 flights of the Torn Research Airplane on June 11, 1956, in Technical Report No. 3. In Technical Report No. Fujita and Brown describe a revised method of pressure reduction suitable for mesoscale stu regardless of topography. Fujita, in Technical Report No. 5, discusses mesoscale studies 100 mi in horizontal dimension and follows this with a report of work done by the Severe L Storm Research Project at the University of Chicago. A study of radar echoes revealed the that the movement of individual echoes and that of the squall lines are quite different. Analy showed that a mesosystem seen in Japan had features similar to those usually seen in the U. Using the surface and upper air observations taken by the Thunderstorm Project, Ohio, compo charts covering an area of 130 × 100 mi were analyzed by Fujita in Technical Report No This analysis revealed that a pressure surge line does not result from an upper disturbance, is the leading edge of an outflowing cold air dome, the top of which does not reach the 700 level. No evidence of discontinuity in temperature and wind velocity is found at any level ab the surface pressure surge line east of the cold dome. Newton, in Pt. 2, No. 1, considers physics of convective clouds. When vertical shear is present a hydrodynamic (nonhydrosta pressure field is induced by relative motions near the boundaries of a large convective sys which does not move with the ambient winds. This tends to make the cloud tilt away from vertical, but at the same time vertical gradients of hydrodynamic pressure aid the formation new convection. Expressions are derived for the accelerations concerned. The author devel an hypothesis which accounts for the observed movements of large convective rainstorms, so what toward the right of the winds in the convective layer, and is consistent with the prefere of severe phenomena, such as tornadoes, for a particular flank of a rainstorm. Distinctio made between large and small clouds as affected by shear. In Pt. 2, No. 2, Newton and K examine the motions of large rainstorms of the kind associated with squall lines, in relation to winds aloft. Newton, in Pt. 3, No. 3, discusses the general processes leading to the developm of convective precipitation ahead of a major cyclone, including the effects of horizontal advec and vertical motions on the creation and triggering of potential instability. *Subject Head* **1. Severe storm analysis.**—*Based on authors' abstracts.*

12N–222 551.515:551.556.8:551.466.327

Danielsen, Edwin F. (*Dept. of Met., Univ. of Wash.*); Burt, Wayne V. (*Dept. of Gen. Sci-?, Oregon State College*) and Rattray, Maurice, Jr. (*Dept. of Oceanog., Univ. of Wash.*), **ensity and frequency of severe storms in the Gulf of Alaska.** *American Geophysical Union, nsactions,* 38(1):44–49, Feb. **1957.** 6 figs., 7 refs. **DWB, DLC**—A review of the circum-ces surrounding the sinking of the S.S. "Pennsylvania" with all hands in the Gulf of Alaska ng Jan. 1952, necessitated an historical survey of severe storms in the Gulf of Alaska. The ose of the investigation was (1) to determine from weather data the frequency and variability ccurrence of storms which would generate very high waves, and (2) to demonstrate the im-ance of factors other than measured wind speed such as duration, fetch, and air-sea tempera-difference on development of very high wind waves. Criteria were developed for screening the storms which probably generated high waves and sustained them for long durations. From records for the winters of 1922–23 to 1951–52, excluding World War II years, 15 storms were cted and critically examined for their wave creating potential. The "Pennsylvania" storm of 8–10, 1952, was considered the most severe and herein is compared with two other storms of ier wind speeds which did not generate higher waves. In addition, a longer period storm sur-of high Jan. winds shows a large annual variability with Jan. 1952 the extreme. *Subject dings:* **1. Severe storm frequencies 2. High wind waves 3. Shipwrecks 4. S.S. "Penn-ania" 5. Gulf of Alaska.**—*Authors' abstract.*

12N–223 551.515.2(213)

Schell, Irving I., **On the nature of tropical storms relationships.** *Tufts Univ. Meteorologi-Studies,* No. 57-1, April **1957** (Unpublished ms.). 10 p. 3 figs., 2 tables, 5 refs. **DWB**—5-yr series of sea surface temperatures, winds and cloudiness over several areas in the tropical ntic between latitudes 20°N and 4°S was examined with regard to the frequency of tropical ntic storms during two 8-yr periods and one 9-yr period. During the first two periods the age tropical storm frequency was 6.1 and 5.8 per yr, respectively, and these values were ciated with below average sea temperatures and above average wind speeds during the Aug.–season in the intertropical convergence zone and during the preceding months in the north-trade wind belt. During the 9-yr period the average storm frequency was 12.1 per yr, and associated with above average temperatures and below average wind speeds in both areas ng the Aug.–Oct. season and preceding months, respectively. It is also concluded that the of tropical storms in the South Atlantic is due to the fact that the zone of favorable wind temperature conditions during the Southern Hemisphere summer remains near the equator re the Coriolis force is too weak for storm development, and is not due to a lack of high tem-tures. *Subject Headings:* **1. Tropical storm frequencies 2. Equatorial meteorology 3. th Atlantic.**—*Author's abstract.*

12N–224 551.515:551.543.5

Khorosheva, V. V., **Vliianie atmosfernogo davleniia na naklony zemnoĭ poverkhnosti.** e influence of atmospheric pressure on the slope of the Earth's surface.] *Akademiia Nauk R, Izvestiia, Ser. Geof.,* 1:131–135, **1958.** 3 figs., 3 tables, 2 refs., 4 eqs. **DLC**—The study he slope of the Earth's surface can serve as a method for determining instrumentally secular ements of the Earth's surface. In this study the author examines the magnitude and depth enetration of pressure slopes by calculations based upon the theory of elasticity. In the method loped by the author, atmospheric disturbances (cyclones or anticyclones) are regarded as dis-ated in individual regions, i.e., circles with uniform positive or negative pressure. By com-ng the effect of each adjoining atmospheric disturbance upon the slope at a given point, the basic slope and also the distance of any pressure disturbance can be determined. The results alculations of the magnitude of horizontal and vertical displacements produced by an anti-one with a radius of 500 km and pressure of 50 mb upon a granite expanse and the magnitude ngles of slope of the granite expanse under this pressure are given in tables. Also the results ctual measurements carried out at Poltava are presented. The computations indicate that the nitude of these indications is insignificant. The deepest atmospheric disturbance yielded a e of thousandths and hundredths of a sec (maximum). *Subject Headings:* **1. Pressure effects Earth's surface slope 2. Atmospheric disturbances 3. Geophysical phenomena 4. Pol-, Ukrainian S.S.R.**—*I.L.D.*

12N–225 551.515:551.553.8:639.2

Mertins, H. O., **Die Strumhäufigkeit auf den Fischfangplätzen im Jahre 1958.** [Storm uency over fisheries in 1958.] *Wetterlotse,* Hamburg, No. 143:63–65, March **1959.** 2 tables, **B**—The hours with winds above 8 on the Beaufort scale were computed by the Seewetteramt, burg, from the weather charts of 17 fisheries. *Subject Headings:* **1. Storm frequency data ale statistics 3. Fisheries.**—*O.T.*

12N–226 551.515:551.577.37(5

Parthasarathy, K. (*Met. Off., New Delhi*), **Comparison of the depth-area-duration val of the biggest recorded storms in different parts of India.** (In: Symposium on Meteorolog and Hydrological Aspects of Floods in India, New Delhi, April 1958, **Proceedings.** Delhi, Ind Meteorological Dept., **1959.** p. 15–20. 3 figs., 2 tables, ref.) **DWB** (M79.4 S989pr)—Data probable maximum number of storms for a basin is one of the essential items of information quired by engineers for adapting a design of spillways and other flood control works. In paper the results of isohyetal analysis of five of the biggest storms on record in different parts India are presented and discussed. This analysis is the first step in the derivation of the proba maximum number of storms for the different regions. It is found: 1) Storms of very h rainfall yield can occur in areas of comparatively poor annual rainfall. 2) The maximum st rainfall over areas up to 10,000 sq mi differs little from region to region. *Subject Headin* **1. Storms 2. Storm rainfall analysis 3. India.**—*Author's abstract.*

12N–227 551.515(2

Wilgus, Russell V. (*U. S. W. B., San Francisco*), **Eastern North Pacific tropical stor 1957.** *Mariners Weather Log,* Wash., D. C., 2(2):34–37, March **1958.** 2 figs. **DWB**— tropical storms of the 1957 season originated in the area between 10°N and 20°N from Mexican coast to 120°W with one exception which apparently developed near 18°N and 125° Four of the storms moved N or NW and dissipated over the ocean areas; 3 of the storms mo inland and dissipated; 2 of the storms moved westward for unusually great distances and dissipa over the ocean area. *Subject Headings:* **1. Tropical cyclones in Eastern North Pacific North Pacific.**—*N.N.*

Barometric Depressions, Extratropical Cyclones (551.515.1)

12N–228 551.515.1/2:550

†Morelli, Carlo, **Contributo allo studio dei microsismi.** [Contribution to the study microseisms.] *Rome. Istituto Nazionale di Geofisica, Pubblicazioni,* No. 166, **1948.** 32 p. figs., 2 tables, 17 refs. **DLC.** Reissued as *Trieste. Istituto Talassografico, Pubblicazioni,* 244. **DLC**—Previous work on the relationship between microseisms and storms, and on physical characteristics of microseisms themselves, is reviewed systematically, and characteris of those observed or recorded at Trieste are related to the location of cyclones at sea or to di tion of pressure gradients. Charts of Europe and the N Atlantic show these relationships. tant and local microseisms are discussed. The intensity of the microseisms is found to h function of the depth of the cyclone, especially of the pressure gradient. *Subject Headi* **1. Cyclonic microseisms 2. Microseismic storms.**—*M.R.*

12N–229 551.515.1:629.12(

§Brown, P. R., **Loss of the "Flying Enterprise."** *Marine Observer,* 22(157):134–144, **1952.** 9 figs., photo. Also: **Weather experienced by the "Weather Observer" on 26th– December, 1951.** *Ibid.* p. 145–146. fig. Also: **The depression of December 26th–27th, 1** *Ibid.,* p. 147–150. 4 figs., 3 refs. **DWB**—Account of the weather in the N. Atlantic on 25, 1951–Jan. 10, 1952, with synoptic charts. At the location of the "Weather Observer" Dec. 26, the barometer fell to 938.4 mb. The third article relates wind speed to distance f center and to pressure, showing presence of a solid vortex with v/r constant, surrounded by area of decreasing wind (vr constant). *Subject Headings:* **1. Extratropical cyclones 2. N Atlantic.**—*C.E.P.B.*

12N–230 551.515.1:629.12(

van der Bijl, Willem, **Waarom verging de "Flying Enterprise"?** [Why did the "Fl Enterprise" sink?] *Hemel en Dampkring,* 50(4):72–73, **1952.** 2 figs.—An examination is m of the meteorological conditions which led to the sinking of the "Flying Enterprise." In frontal zone extending from the Rockies to England, winds attained a velocity of 400 km/hr 10 aloft. These winds produced a hurricane at the surface on Dec. 26, 1951. A new depres 946 mb, was formed in midocean and moved northeastward as the ship approached the south coast of England. On Dec. 28, a new storm appeared from west of Ireland with wind veloc of 120 km/hr. A barograph record from Dec. 25 through Dec. 28, 1951, taken on a wea ship and a synoptic chart for Dec. 29, 1951 are presented. *Subject Headings:* **1. Hurricane w 2. Upper air winds 3. Marine disasters.**—*I.L.D.*

12N–231 551.515.1:551.515.7:551.509

§*Austin, James Murdoch, **Some features of 500-mb troughs and ridges.** Massachusetts stitute of Technology, Contract N5ori-07804, Technical Report, No. 12, Dec. 15, **1952.** 1

figs., 8 tables, 11 refs. **DWB**—The results of an empirical study of 500 mb patterns are sented. It is shown that the prediction of the 24-hr and 48-hr intensification or weakening troughs and ridges can be aided by a consideration of upstream changes. Qualitative rules for prediction of a 24-hr change in the speed of troughs and ridges are included. Finally, a matological summary is presented of intensification, weakening and speed of troughs and ridges. *bject Headings:* **1. Troughs and ridges 2. Synoptic studies 3. Short range forecasting hniques.**—*Author's abstract.*

12N–232 551.515.1:550.342(914)

Deppermann, C. E. (*Dir., Manila Obs., Baguio, Phil.*), **Microseisms at Mirador, Baguio City. ilippines.** *Weather Bureau, The Elements,* 4(9):18–20, Oct./Dec. **1953. DWB**—The author cusses the effect of immediate environmental conditions upon the objectivity and reliability of smographic recordings of microseisms; relationship between microseisms and typhoons; fronts; northeast monsoon thunderstorms and winds. Also plans for microseismic research and sug-stions for an ideal microseismic setup are outlined. *Subject Headings:* **1. Cyclonic microseisms Microseism research 3. Baguio, Philippine Islands.**—*I.L.D.*

12N–233 551.515.1:551.547(941)

§Gaffney, D. (*Australian Weather Bureau, Perth*), **Formation of weak troughs off the S.W. ast of Western Australia.** *Australian Meteorological Magazine,* Melbourne, No. 4:15–28, Aug. 53. 9 charts. **DWB**—Synoptic study of diurnal development of a trough off the west coast Australia at a time of positive isallobar (ridge) on Sept. 4 and 5, 1952. Trough extends to) mb level as does the island high pressure cell. Cold temperature inland results in greater bsidence than on coast. Consequent mechanism of diurnal trough formation and weakening is lined and illustrated by 8 synoptic charts for W. Australia and adjacent seas. *Subject Head-s:* **1. Trough formation 2. Atmospheric pressure effects 3. Western Australia.**—*M.R.*

12N–234 551.515.1:551.511:551.509.312

Means, Lynn L. (*U. S. Weather Bureau, Chicago, Ill.*), **An investigation of cyclone de-opment—Storm of December 13–15, 1951.** *Monthly Weather Review,* 83(9):185–198, Sept. 55. 8 figs., 3 tables, 6 refs., 16 eqs. **DWB**—The development of a storm which occurred in U. S. during the period Dec. 13–15, 1951, is investigated. An attempt is made to ascertain what extent this development could be accounted for by the terms in the vorticity equation ich derive from the vorticity advection and the thermal advection. It is found that the com-ed patterns agree well with those observed, although the numerical values are considerably ggerated. Computed values of vertical velocity and divergence are compared with the observed terns of clear sky and precipitation, and, on the whole, good agreement is found. The findings e gained further support from other storm studies and from experience in the use of vorticity rts and thermal advection charts in routine forecasting. *Subject Headings:* **1. Cyclone de-opment 2. Vorticity computations 3. Advective dynamic analysis.**—*Author's abstract.*

12N–235 551.515.1:656.6

Frank, Hans, **Ein Zyklonenritt um Skagen vom 9. bis 12. August 1954.** [A cyclonic age around Skagen Aug. 9–12, 1954.] *Wetterlotse,* No. 80:249–254, Dec. **1954.** fig. **DLC**—cht "Taygeta 2" left Büsum Aug. 9 to sail round Denmark, reaching Grenaa Aug. 12. A all but deep depression (980 mb) lay W of Denmark on Aug. 10. Winds, weather and sailing ctice are described. *Subject Headings:* **1. Meteorology in navigation 2. Danish waters.**—*E.P.B.*

12N–236 551.515.1:551.588.1(4):551.509.318

Maede, Hans (*Potsdam*), **Der Einfluss der Land-Meer-Verteilung in Mitteleuropa auf das rhalten von Tiefdruckgebieten verschiedener Typen.** [The influence of land-sea distribution Central Europe on the behavior of various types of low pressure regions.] *Zeitschrift für teorologie,* Berlin, 5(6):161–173, June **1954.** 6 figs., 6 tables, 8 refs.—Preliminary to an ensive statistical synoptic study of the pressure and temperature conditions at the surface and the upper atmosphere and their interdiurnal changes during quasistationary lows over Central rope, the author examined statistically the behavior of four types of low pressure regions, nely, quasistationary or K-lows occurring usually during broad scale weather situations; gge's rapid (Polar) weather type; cyclonic broad scale weather situations including the Vb e; and the small warm lows. The frequency distribution, regions of origin and filling, inter-rnal pressure changes in the core and their rate of travel were determined for Central Europe May and Nov. with reference to the distribution of land and sea. The frequency of deep es over the water was lower in May and higher in Nov.; this is especially true for the K-low,

and also, the regions of origin and filling. Similarly the frequency of the origin and filling lower in May and higher in Nov. over water. The interdiurnal surface pressure changes in t deep cores show seasonal variations, the K-situations manifesting the largest increases in pressu especially in Nov. The velocities of the Polar lows and Vb-type lows are larger in Nov. than May and always larger than the relatively invariable quasistationary lows. *Subject Heading* **1. Barometric depressions 2. Continentality 3. Grosswetterlagen 4. Central Europe.**—*I.L.*

12N–237 551.515.1:550.3

§Bernard, Pierre, **Etude d'une tempête microséismique dans les stations côtières l'Atlantique nord.** [Study of a microseismic storm at the North Atlantic coastal station *France. Comité Central d'Océanographie et d'Etude des Côtes, Bulletin d'Information,* 8(3):7 81, March **1956.** 16 figs. **DLC**—The microseismic effects of a single storm traveling fr Bermuda to Europe are investigated for available coastal stations. The microseismic wa propagated with swell velocity as far as Morocco and several Arctic stations. Amplitude a periods are shown, as well as synoptic maps for the whole development. *Subject Heading* **1. Storm microseisms 2. North Atlantic.**—*A. Assur.*

12N–238 551.515.1/2:551.5

Burtsev, A. I., **Evoliutsiia osadkov v sviazi s izmeneniem vlagosoderzhaniia vozduk i vertikal'nykh skorosteĭ v sisteme tsiklona.** [The evolution of precipitation in connection w variations in the moisture content of the air and vertical velocities in a cyclone system.] *Me orologiia i Gidrologiia,* Leningrad, No. 1:9–12, Jan. **1956.** figs., 2 tables, ref. **DWB, DLC** The author presents the results of calculations of vertical velocities and the moisture content air in a system of cyclones as a basis for observations on the evolution of precipitation. Verti velocities were calculated by means of G. I. Morskoi's method and data are given on the verti air velocities (mb/12hrs) at different points of a cyclone system at isobaric surfaces of 850, 7 and 500 mb, mean vertical velocity, mean water content and amount of precipitation in the cycl system analyzed. *Subject Headings:* **1. Cyclonic precipitation 2. Vertical velocities.**—*I.L.*

12N–239 551.515.1:551.43(234.4

§Lépp, Ildikó, **Az északmagyarországi ciklonok kialakulásának újabb példája.** [Anot example of the formation of North Hungarian cyclones.] *Időjárás,* Budapest, 61(2):137–1 March/April, **1957.** 3 figs. **DLC**—In an article, Z. Ozorai described the phenomenon of ographic occlusion in the Carpathian basin (*see* 9.2–202, Feb. 1958, *MAB*). The author of present note gives another example (synoptic charts and pressure curve presented) of the occ rence of orographic occlusion involving (as in the example given by Ozorai) the formation o shallow cyclone on the southern side of the Carpathian range during an invasion of cold air fr the northwest. *Subject Headings:* **1. Cyclone development 2. Orographic effects on cyc genesis 3. Carpathian Basin.**—*G.T.*

12N–240 551.51

On the extratropical cyclone encountered the Kobe-Marū. *Journal of Oceanograp* Japan, Ser. 2, 8(1):14–16, March **1957.** 3 figs., table. In Japanese. **DLC**—In Dec. 1956, "Kobe-Marū" encountered an extratropical cyclone in the Aleutian Islands. On Dec. 16, cyclone started in Soya Strait with pressure at the center reaching 996 mb as it moved towa the Okhotsk Sea on the 17th. Maximum wind velocity increased on Dec. 23, with the cycl heading NE. The path followed by the cyclone and weather variations, including pressure served on the "Kobe-Marū," are given. *Subject Headings:* **1. Extratropical cyclones 2. Jap** —*K.C.*

12N–241 551.515.1:551.543:551.577

Pristov, J., **Vremenska dogajanja v zvezi a prodorom hladnega zraka preko Alp in vp orografije na padavine.** [Weather occurrences in connection with the advance of cold air o the Alps, and orographic influences on precipitation.] *Društvo Meteorologov Slovenije, Me orološko Zbornik,* 1:70–91, **1957.** 10 figs., 2 tables, 8 refs. English summary p. 89–91. **DV** (M(055) D797me), **DLC**—For weather occurrences, orography, and connected with it, the fo tion of the orographic depression on the southern side of the Alps, are of great importa Orography finds its direct expression in the active advection of the warm and damp air from SW. The temperature gradient in this air is usually smaller than the pseudoadiabatic gradi and along the strongly marked mountain barriers, it seldom thunders. In such cases, the sou western slopes of the Julian Alps get more than 200 mm of precipitation within 24 hrs, while eastern part of Slovenia receives no precipitation, but only changeable cloudiness. For the tensity of the precipitation along the particular mountain barriers, the direction and speed of

h altitude currents, as well as the humidity of the air and the shape of the mountain barrier, of importance. As soon as the active advection of the warm air ceases, the influence of graphy on precipitation becomes smaller. Characteristic of every advance of the cold air from N or NW is the formation of the orographic depression over the Po Plain or over the northern riatic, but a depression formed in this way in Genoa Bay is very rare. Most meteorologists, dying the formation of the secondary depression to the south of the Alps, explain its formation h the advance of the cold air over the Rhone Valley. This thesis holds good for the depressions ining independence. Apart from this, there are also restrictive depressions, one of which uences greatly the weather of Slovenia. *Subject Headings:* **1. Cold air movements-weather ationships 2. Orographic effects on precipitation 3. Alps 4. Slovenia.**—*From author's tract.*

12N–242 551.515.1:551.577(47)

Zhakov, S. I., **Iugo-zapadnye tsiklony i osadki na Evropeĭskoĭ chasti SSSR.** [Southsterly cyclones and precipitation in the European U.S.S.R.] *Priroda,* Moscow, No. 3:94–95, rch, 1957. foot-ref., fig. **DLC**—A survey based on 7 seasons shows the % of the total pretation in April–Oct. caused on the Polar front by southwesterly cyclones. It varies from 0% on the coast of the Black Sea to 5% in the extreme northeast of Europe. *Subject Heads:* **1. Cyclonic precipitation 2. Synoptic climatology 3. European U.S.S.R.**—*A. Assur.*

12N–243 551.515.1/2:551.578.1(522.4)

***Uriu, K. and Araki, K., On the distribution of rainfall amount in Miyazaki Prefecture ised by cyclone and typhoon.** *Journal of Meteorological Research,* Tokyo, 10(8):698–703, g. 1958. figs., 5 tables, ref. In Japanese. **DLC**—For the purpose of forecasting precipitation, ng upper air wind, season, and storm track data, the author compiled data for the whole of azaki Prefecture and certain areas of Kagoshima and Kumamoto Prefectures. The storms e classified as typhoons and cyclones. In order to make an arithmetical mean sufficient for representation of precipitation, the authors dealt with 41 typhoons which passed near Kyushu nd between 1937–1956, and 101 cyclones between April 1955 and Dec. 1956. Quantitative ults were stressed, namely, the intensity of the cyclone, continuance of rainfall and water vapor the land area of this particular region. *Subject Headings:* **1. Typhoon rainfall forecasting Cyclonic rainfall forecasting 3. Japan.** *J. Woo.*

12N–244 551.515.1(261)

Cry, George W. (*Office Climat., U. S. W. B.*), **Frequency and movement of North Atlantic pical cyclones.** *Mariners Weather Log,* Wash., D. C., 3(4):118–125, July **1959.** 6 figs., e. **DWB**—Some clues to tropical storm and hurricane movement in various areas during ain portions of the season may be obtained from a study of the past behavior or climatology of se storms. An extensive compilation of tropical storm and hurricane tracks for the years 6–1957 has been completed in the Office of Climatology, U. S. Weather Bureau. As a corollary this work, charts were prepared. In this paper, charts covering the period June–Nov. are sented, indicating direction frequency, speed, number of hurricanes and tropical storms, and m frequency. *Subject Headings:* **1. Tropical cyclone frequencies 2. North Atlantic.**—*W.N.*

12N–245 551.515.1:551.515.7

Dunn, Carlos R. (*Extended Forecast Sec., U. S. W. B., Wash., D. C.*), **The weather and culation of July 1959: The second consecutive July with an unusual circulation pattern.** *nthly Weather Review,* Wash., D. C., 87(7):275–282, July **1959.** 13 figs., table, 11 refs. **VB, DLC**—For the second successive July many of the troughs and ridges on the 700 mb lay mean map were not in the climatologically preferred locations indicated in studies made by EIN and WINSTON. This was especially true of the western sectors of the Northern Hemere in July 1958; again in July 1959 an abnormal trough appeared over the central U. S. the eastern and western coastal areas, where weak ridges were observed, the circulation was e anticyclonic than usual. This regime was associated with generally light precipitation in west but heavy rainfall in several large areas east of the Rocky Mountain States. Rainfall n tropical cyclones "Cindy" and "Debra" augmented the total precipitation in Tex. and along east coast. Temperatures averaged below normal in most of the central and southeastern states were above normal in most other regions, with record heat reported in the far southwest. *ject Headings:* **1. Troughs and ridges 2. Trough displacement 3. Cyclonic precipitation Jnited States.**—*Author's introduction.*

12N–246 551.515.1:551.524.36:551.578.45(478)

Kuklin, S. B., **Kholoda na Urale.** [Cold in the Urals.] *Priroda,* No. 9:128, Sept. **1959.** C—Unusual cold prevailed in the Urals in 1958. Violent cyclones were observed in the

second half of Sept. Severe snowstorms occurred in Sverdlovsk and Chelyabinsk regions. T mean daily atmospheric temperature of Sept. 17 and 18 was the lowest recorded in 122 yrs. E tensive snowfall produced considerable damage to forests, gardens and parks. *Subject Heading* **1. Unusual weather conditions 2. Low temperatures 3. Snow damage.**—*I.L.D.*

Mechanics and Thermodynamics (551.515.11)

12N–247 551.515.

Noth, H., **Über Zyklogenese.** [On cyclogenesis.] *Germany. Deutscher Meteorologisch Dienst im Französischen Besatzungsgebiet, Wissenschaftliche Arbeiten,* 1:128–132, **1947.** 4 fig 2 tables. **DLC**—Basis for theory is that effect of high level winds and dynamic changes in upp troposphere, tropopause and lower stratosphere is paramount, and that meridional compensati could be considered in long range forecasting. *Subject Heading:* **1. Cyclogenesis.**—*M.R.*

12N–248 551.515.11:551.524.

Fisher, Edwin L., **Upper level temperature fields associated with east coastal cyclogenes** Contract Nonr-285 (09), Project SCUD, Technical Paper, no. 1, April **1954.** 11 p. 20 figs., re **DWB**—Includes several case studies of east coastal cyclogenesis with particular emphasis on t analysis of the temperature distributions at the 500 and 200 mb levels. Some theories of cyc genesis are reviewed and the possible applications of upper level temperature analysis to forecasti are discussed. Analysis of data collected by the dense network of upper air stations in the U. shows clearly the negative correlation between the tropospheric and stratospheric temperature fiel which was first demonstrated statistically by DINES (1912). The observed modification of the fields before and during cyclone development, a process in which vertical motion plays a promine role, is found to be a sensitive and sometimes prescient indicator of cyclogenesis. *Subject Hea ings:* **1. Cyclogenesis theories 2. Upper air temperature-cyclogenesis relationships.**—*Fr author's introduction.*

12N–249 551.515.

Gensler, G. A. (*Kloten*), **Kaltlufttropfen des Spätfrühlings 1954, im speziellen ih Bewölkungs- und Niederschlagsstruktur.** [Upper cold lows of late spring 1954, especially th cloudiness and rainfall structure.] *Schweizerische Naturforschende Gesellschaft, Verhandlung* 134:110–111, **1954. DWB, DLC**—The onset of upper cold lows is connected with large sc displacements of cold zones (for example, from Canada or the Northern Urals) and the presen of a shield against new westerly, upper air cyclones. The phenomenon is evident from the typi structure of clouds and rainfall, which varies, depending on the lifespan of the upper cold l On the basis of several dozen flight reports, the author describes and discusses the successi development of the cloud structure in the initial and main stages of the phenomenon, and the wi frequency, and amount of rainfall. It is pointed out that the phenomenon is neither a Bjerkn low, nor a wandering cold air mass, with strong winds flowing over and around it. Its structu is complex, due to the backward inclination of the axis of its upper centers and troughs, and the changing, in space and time, of its vertical currents. *Subject Heading:* **1. Cold lows alo** —*A.M.P.*

12N–250 551.515.11 551.515.21 551.515

§†New York Univ. College of Engineering. Research Div., **Notes on cyclone developm in the United States.** Contract Nonr-285 (09), Project SCUD, Technical Paper, no. 2, Se **1954.** 36 p. 45 figs., 2 tables, refs. at end of most sections. **DWB**—Contents: Ballenzwe Emanuel M., **Composite 200 mb temperature fields above extratropical cyclones,** p. 1 Herman, Benjamin M. and Kinney, John J. R., **Vertical motions in an upper level cyclo** p. 10–20. Ohring, George, **Computations of long wave radiational cooling in extratropi cyclones,** p. 21–34. **Monthly frequencies of cyclogenesis in the east coastal region of United States,** p. 35–36. In the first paper a study was made of 6 cyclones which form secondaries and 7 which did not (Eastern U. S., Dec. 1952–Feb. 1954), to see whether Fish (1954) theory that warm air intrudes at 200 mb prior to development of secondaries along E Coast of U. S. is correct. Composite charts for 200 mb level for various periods (0 — 2 0 — 12h, 0, and 0 + 12h) show no warm tongue which would predict secondary formation 24 ahead, but at 12 hrs before and at zero hr the warm tongue (to the southeast) is more promin in the group that produced secondaries than in the other group. Statistically, the sample is small to give any degree of confidence, though the observed temperature differences are la In the second paper (HERMAN and KINNEY) the fields of vertical velocity are computed presented for 500 and 200 mb levels for a cold cut-off (warm stratosphere, low tropopause) cycl (Dec. 5 and 7, 1950 for Mississippi Valley and Great Lakes region). At 500 mb, air was ris

3 areas to the E, SE and SSE of the low and sinking W and SW of the low. At 200 mb, air is sinking to W, SW and SE of the low, whereas in the low, vertical motion was nearly zero, d to the NW air was rising above an area where it was sinking at 500 mb, and as the low vanced, rising air occurred ahead (NNE) of the center. Horizontal velocity divergence between 0 and 500 mb is also calculated for Dec. 5, 6 and 7, 1950. In the paper by OHRING the radia- nal warming or cooling at the bottom, within cloud layers and on the top of cloud layers con- cted with 2 cyclone situations (Apr. 1–2, 1953; Nov. 20, 1953) in the Middle West and East, calculated and shown on adiabatic charts for each radiosonde station in the area (Omaha, ntoul, Mt. Clemens, Buffalo, Columbia, Pittsburgh, etc.). Cooling rates of $> 8°C$/day at top d warming of 1°–2°C at the bottom of cloud layers are computed. Large cooling rates result nen steep inversion occur at cloud top. This radiation process results in greater instability thin the cloud layers. Warming at cloud top from short wave radiation is appreciable in day- ne but not at night. The last paper gives tabulations of frequency of cyclogenesis for each nth from 1929–1939 and 1942–1952, for 4 types of cyclogenesis, for months, Sept.–May, inclu- e. *Subject Headings:* **1. Cyclone structure 2. Composite charts 3. Vertical motions in clones 4. Cyclogenesis 5. Eastern United States. I. Spar, Jerome.**—*M.R.*

12N–251 551.515.11

§McRae, J. N. (*Central Met. Bur., Melbourne*), **A case of cyclogenesis associated with an per cut off low.** *Australian Meteorological Magazine,* Melbourne, No. 11:36–46, Dec. **1955.** figs., 7 refs., 2 eqs. **DWB**—The theory of the mechanism of the development of upper cut-off ws is reviewed briefly. Mention is made of the surface cyclogenesis frequently associated with per cut-off lows A situation in June, 1950 when cyclogenesis over eastern Australia followed e development of a cut-off low is described. *Subject Headings:* **1. Cyclogenesis 2. Cut-off ws.**—*Author's abstract.*

12N–252 551.515.11/.2

Sakuraba, Shin-ichi, **The effect of condensation level on the development of a typhoon.** *urnal of Meteorological Research,* Tokyo, 7(2):104–105, March **1955.** 2 refs., eqs. In Japanese. **WB**—Theory is developed and data for 0, 0.5 and 1 km are analyzed by way of application of eory that energy supply from ocean is an important factor in development of a typhoon. *Subject eadings:* **1. Typhoon development 2. Condensation level over ocean.**—*M.R.*

12N–253 551.515.11

Hinkelmann, Karl, **Ein Beitrag zur Theorie der Zyklonenentwicklung.** [Contribution to e theory of cyclogenesis.] *Germany. Deutscher Wetterdienst, Berichte,* 4(22):92–107, **1956.** figs., 2 refs., 16 eqs. English transl. issued as Germany. Deutscher Wetterdienst, Contract 61(514)-735 C, Technical (final) Report, June **1957.** Sec. N (34 p.) **DWB**—The author scusses mathematically: the physical laws describing atmospheric processes such as the vorticity eorem, conservation of rotational impulse in the absence of rotational momentum; the continuity uation and conservation of mass; the adiabatic equation and the geostrophic wind equation; velopment of an initial cyclogenetic or anticyclogenetic disturbance in a baroclinic field, including analysis of conditions required for the initiation of the developmental process, namely, change relative topography and in absolute topography, tendency towards trough and ridge axes; the ld of wind divergence; vertical circulation; modification of axial inclination as a consequence of nvective temperature change; cyclonic energy exchange; deepening of the cyclone and intensi- ation of the anticyclonic process; change in relative and in absolute topography; field of diver- nce, vertical circulation; the energy sources of cyclonic or anticyclonic development; asym- trical development of cyclones and anticyclones and influence of surface friction. *Subject eadings:* **1. Cyclone development 2. Cyclone theories.**—*I.L.D.*

12N–254 551.515.11(262)

*Urbani, Marcello, **Sui cicloni atlantici influenzanti il Mediterraneo durante l'inverno.** tlantic cyclones affecting the Mediterranean during winter.] *Rivista di Meteorologia Aero- utica,* 16(4):39–41, Oct./Dec. **1956.** table, foot-refs. French, English and German summaries 39. **DWB**—Atlantic cyclones which affected the Mediterranean area in winter during the riod 1945–1955 are statistically analyzed in respect to their place of origin, direction of trajec- y and relation to the general synoptic situation. *Subject Headings:* **1. Cyclone analysis 2. tlantic cyclones 3. Mediterranean Region.**—*G.T.*

12N–255 551.515.11:551.501.7

Bose, B. L. and Rao, D. V. (*both, Met. Off., New Delhi*), **Thickness patterns and intensi- ation of Bay storms.** *Indian Journal of Meteorology and Geophysics,* Delhi, 8(1):55–60, Jan.

1957. 4 figs., 12 refs. **DWB, DLC**—Case histories of premonsoon Bay of Bengal storms (Ma 9–22, 1952) are analyzed to test the J. Bjerknes (1944) hypothesis that a W or NW tilt in a easterly (west moving) cyclone results in filling and an E or SE tilt results in deepening. Al though all storms do not fit a given model, the evidence presented tends to support the hypothesis Thickness patterns (100–700 and 700–500 mb), thermal winds and other details are described an illustrated by upper air charts. *Subject Headings:* **1. Cyclogenesis 2. Thickness patterns 3 Bay of Bengal.**—*M.R.*

12N–256 551.515.11:551.515.71:551.543.

*Reshetov, V. D., **Ob osobennostiakh sutochnogo khoda davleniia v tsiklonakh i anti tsiklonakh.** [Characteristics of the daily course of pressure in cyclones and anticyclones. *Meteorologiia i Gidrologiia,* No. 2:24–26, Feb. **1957.** fig., table, 2 refs. Transl. into English **DWB**—The problem of whether differences in the daily variation of pressure exist during cyclone and anticyclones is particularly important in understanding the mechanism of formation of th pressure field at the Earth's surface. Hourly values of atmospheric pressure were measured a Dolgonrudnaia (near Moscow). Graphs show the daily variation of atmospheric pressure in lo and high pressure areas during the winter and during the summer, and daily variation in pressur during Jan. and May without separation into regions of high and low pressure. Also, numerica data on the daily march of pressure in high and low pressure areas (averaged for 1949–1954) ar presented. A 24-hr wave was observed; the daily variation of pressure in regions of high an low pressure are opposite, during both summer and winter. The amplitude of daily variation determined separately for low and high pressure is 1.1 and 1.3 mb, but without separation int high and low pressure areas, a 12 hr pressure wave appears and its amplitude is 0.5–0.8 mb. Th results obtained do not confirm Kelvin's suppositions on the resonant character of the variatio of atmospheric pressure brought about by upward flow of air during diurnal heating. Equall inadequate is Mertsalov's assumption that as a result of the daily variation of turbulence an the divergence and convergence of air masses in the lower atmosphere, pressure should diminis by day in anticyclones and increase in cyclones. The daily variation of pressure is explained a follows: since there are usually cold formations in the upper layers and anticyclones are warm the intensity of cyclonicity and anticyclonicity usually intensifies with height. Hence the turbulen exchange of the upper cyclonic vortex may be transmitted downward, a process that intensifies b day. The wind velocity may exceed the gradient wind; since Coriolis force exceeds the gradien pressure, the antigradient ejection of air in these layers from the cyclone system should intensify so that it overlaps the convergence in the friction layer, and cyclone deepening results. In anti cyclones there occurs a more intensive transfer of the upper anticyclonic vortex to the downwar circulation as a result of increased turbulent exchange by day; hence the surface anticyclone i intensified. *Subject Headings:* **1. Diurnal pressure variations 2. Cyclone vortexes 3. Anti cyclone mechanics 4. Moscow, U.S.S.R.**—*I.L.D.*

12N–257 551.515.11:551.509.318:551.555.

Zavarina, M. V., **Ob analize transformatsii kholodnykh vozdushnykh mass, dvizhush chikhsia nad Evropeĭskoĭ chast'iu SSSR v teploe vremia goda.** [Analysis of the transforma tion of cold air masses moving over European U.S.S.R. during the warm season of the year. (In: Akademiia Nauk SSSR. Institut Geografii, **Sukhovei ikh proiskhozhdenie i bor'ba s nim** Moscow, **1957.** p. 212–220. 6 refs., 3 eqs.) **DLC** (QC940.R9A6)—The purpose of the analysi presented in this paper, made on the basis of synoptic and height pattern charts, 1947–1951, was t study the changes of the air moisture in air masses moving from the Arctic along the Europea part of the U.S.S.R. in summer, from the north and northwest, in connection with temperatur changes. It is shown that commensurate with the headway of the air mass in the southern an southeastern regions of European U.S.S.R., the absolute air humidity increases. However, owin to the transparency of Arctic air and its scant cloudiness behind the frontal zone, the air warm up considerably commensurate with the movement, and its relative humidity drops greatly. Th is one of the causes of the advent of Sukhovei weather. *Subject Headings:* **1. Cold air mas transformation 2. Synoptic conditions for Sukhovei 3. U.S.S.R.**—*A.M.P.*

12N–258 551.515.11(47

*Kalendov, A. A., **Nekotorye usloviia osushchestvleniia tsiklo- i antitsiklonal'noĭ tsirku liatsii nad Okhotskim morem v vesenne-letniĭ period.** [Some conditions for the developmen of cyclonic and anticyclonic circulation in spring and summer over the Okhotsk Sea.] *Dal'nevo stochnyĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy,* No. 6, pub. Leningra **1958.** p. 71–103. 6 figs., 24 tables, 2 refs. **DWB**—The contents of this study include the fo lowing: structure of the thermal field of the lower half of the troposphere over the Sea of Okhotsk structure of the pressure field aloft over the Sea of Okhotsk; structure of the thermal field of th

roposphere before cyclo- and anticlyclogenesis over the Sea of Okhotsk; characteristics of atmos-heric temperature and relative humidity over the Sea of Okhotsk including distribution of mean ionthly temperatures and relative humidity with altitude; interdiurnal variation of temperature vith altitude over the Sea of Okhotsk; and mean distribution of temperature and relative humidity uring different types of pressure fields. Extensive data are presented in tables. *Subject Head-ngs:* **1. Anticyclone circulation 2. Cyclone circulation 3. Synoptic studies—4. Okhotsk ea, U.S.S.R.**—*I.L.D.*

12N–259 551.515.11:551.43

Preobrazhenskiĭ, V. S., **O vertikal'noĭ poiasnosti v mezhgornykh kotlovinakh.** [Vertical ones of intermountain basins.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geografich,* No. 358–59, May/June 1958. 9 refs. **DWB**—This article analyzes the differences in the zonal belts of con-ave depressions between the mountain ridges and in the belts on the outer slopes of the ridges. Several examples are given to illustrate the analysis; they indicate that the climate in intermoun-ain basins corresponds to that more southern latitudes. *Subject Headings:* **1. Climatic zones 2. ntermountain basins.**—*B.J.G.*

12N–260 551.515.11:551.509.311(988)

Wilson, H. P., **The West Greenland trough.** Canada. Meteorological Branch, *CIR-3025*; TEC-266, March 19, 1958. 8 p. 5 figs., table, 2 refs. **DWB, DLC**—The work reported here vas an effort to study the characteristics of the West Greenland trough as a whole. The plan dopted was to gather data on the behavior and nature of pressure changes along the west coast f Greenland to find out when and how the trough is formed, and to put the results of this and ther studies in the form of forecasting rules. Goose Bay surface and upper air charts for Jan. 950 were utilized. On the basis of these limited data it was found that at least in midwinter, urface pressures along the whole west coast of Greenland are largely controlled by the flow over he southern third, approximately, of the icecap. Because of the proximity of southern Greenland o a major storm track, changes of the direction and speed of the upper flow over southern Green-and are quite frequent and these upper flow changes are in turn reflected in large surface pressure ariations which are transferred northward by the prevailing southerly upper flow north of lat. 5. No objective forecasting techniques for forecasting pressure variations in Baffin Bay could e formulated. *Subject Headings:* **1. Trough structure 2. West Greenland.**—*A.H.K.*

12N–261 551.515.11:551.515.2

Yanai, M. (*Geophysical Inst., Tokyo Univ.*), **On the changes in thermal and wind struc-ure in a decaying typhoon.** *Meteorological Society of Japan, Tokyo, Journal,* Ser. 2, 36(4): 41–155, Aug. 1958. 16 figs., 2 tables, 18 refs., 22 eqs. **DWB, DLC**—In order to make clear he process of energy production in a tropical cyclone, typhoon "Harriet" is studied during its tage of decay and transformation into an extratropical cyclone. Analyzing the temperature field t is shown that the thermal structure changes from the symmetric to the asymmetric configuration nd that the horizontal extent of the warm core decreases. From the analysis of the surface wind ield, the velocity convergence is computed, and some characteristic features of its distribution are escribed. The intensification of the surface front near the typhoon in later stages is discussed rom the standpoint of kinematics. From the expectation that the modification of the structure night cause some changes in production rate of kinetic energy, the correlation between the tem-erature at 700 mb level and the surface convergence, and also the amount of the work done by ifference of the geopotential between the inner and the outer region are estimated. The result hows that the correlation changed in such a way that it causes the production rate of kinetic energy o increase, whereas the amount of the work is remarkably decreased. *Subject Headings:* **1. Ty-hoon deformation 2. Thermal changes in decaying typhoons 2. Wind changes in decaying yphoons.**—*Author's abstract.*

Distribution of Elements (551.515.12)

12N–262 551.515.12:551.586:595.7

Wellington, W. G. (*Forest Insect Lab., Sault Ste. Marie, Ont.*), **Air-mass climatology of Ontario north of Lake Huron and Lake Superior before outbreaks of the spruce budworm, Choristoneura Fumiferana (Clem.), and the forest tent caterpillar, *Malacosoma Disstria Hbn.* (*Lepidoptera; Tortricidae; Lasiocampidae*).** *Canadian Journal of Zoology,* Ottawa, 30:114–127, 1952. 3 figs., 4 refs. *Canada. Dept. of Agriculture, Div. of Forest Biology, Contribution,* No. 54. **DWB**—For the purpose of predicting the population increase to outbreak levels, of the spruce budworm and the forest tent caterpillar, an attempt is made to establish a relationship between the atmospheric conditions favoring the development of these insects and the annual and summer pas-

sage of cyclonic storms, and the air mass characteristics of the cyclones. 20-yr monthly average of cyclone passages over Ontario were determined and the number of cyclone passages and the air mass characteristics of the cyclones during years of insect outbreaks are analyzed. When the number of cyclonic passages in late spring and summer is diminishing and most of the air masses are dry (cP and mT), atmospheric conditions favor the increase of the spruce budworm. On the other hand, when the number of cyclonic passages in spring and summer is above average, and most of the air masses are of southwestern or southeastern origin, the atmospheric conditions favor the increase of the forest tent caterpillar. *Subject Headings:* **1. Air mass characteristics 2. Cyclone characteristics 3. Insect bioclimatology 4. Ontario, Canada.**—*I.L.D.*

12N–263 551.509.311:551.515.1

§Reed, Richard J., **Synoptic study of the mechanics of cold low formation.** Massachusetts Institute of Technology, Contract N5ori-07804, Technical Report, No. 13, May 1, **1953.** 19 p., 2 tables, 18 figs., 9 refs. **DWB**—A detailed synoptic study of an example of a cold low over the eastern U. S. as seen on 500 mb and other upper level charts for March 11–13, 1951. The distinction between the deep cold low or vortex which forms between two jet streams or as a loop at the south end of a trough, and a "kaltlufttropfen" (SCHERHAG) which is stationary and often has the structure of a cold low aloft with an anticyclone at the surface, is emphasized. The effect on tropopause, vertical motion, wind fields, potential temperature distribution, moisture, etc. in the case analyzed is clearly presented. The chief characteristic of this type of cyclone is the fact that it moves, and that mass moves through the vortex, rather than the vortex being a rigid rotating, nonchanging mass. *Subject Headings* **1. Cold low formation 2. Cyclogenesis 3. Tropopause 4. Eastern United States.**—*M.R.*

Life History, Displacement, Tracks (551.515.13)

12N–264 551.515.1

§Rodewald, Martin, **Eine "Störung"—so und so.** [Such and such a disturbance.] *Wetterlotse,* No. 33/34:6–14, Dec. **1951.** 5 figs. **DWB**—An example of very rapid deepening of a depression in N Atlantic, from 1010 to 986 mb in 15 hrs on Sept. 12, 1951. It was attributed to juxtaposition of air masses of 25°C and below 13°C, at neutral point in delta of a frontal zone on edge of a main depression at an embryonic low. Shipboard forecasting of such development is discussed. *Subject Headings:* **1. Cyclonic storms 2. Deepening 3. North Atlantic.**—*C.E.P.B.*

12N–265 551.515.13(269)

*Lloyd, S. H., **Movement of depressions over southern waters.** *Australian Meteorological Magazine,* Melbourne, No. 1:29–32, July **1952.** 3 tables. **DWB**—Statistical analysis of intensity, time of occurrence, position (longitudinally) and average daily movement of depressions and troughs in the subantarctic Ocean area between Cape Leeuwin and Heard Island (between Australia and the Antarctic Continent) based on charts for Sept. 1948–Nov. 1949, which show that: (1) About 50% of depressions passing 73.5°E, produce troughs at 115°E (Cape Leeuwin). (2) They have a mean speed of 25 knots at latitude of Heard Island. (3) No clearcut seasonal trend could be found; most major troughs at 115°E are produced by "major" depressions to S, etc. Statistics are presented. *Subject Headings:* **1. Cyclone intensity-movement statistics 2. Synoptic climatology 3. Subantarctic Seas (Australian Antarctic Seas).**—*M.R.*

12N–266 551.515.13(267,68)

§Kreft, J. (*Southern Rhodesia, Met. Serv.*), **Descriptive account of a cyclone of February 1950.** *South Africa, Weather Bureau, Notos,* 2(3):149–156, **1953.** 7 figs., 2 tables, 2 refs. **DWB**—This cyclone was remarkable for the length of its track; it originated over the Indian Ocean, crossed the northern tip of Madagascar and the Mozambique Channel and then, with reduced vigor, passed over southern Africa to the Atlantic coast and collapsed while recurving eastward over Cape Province and Natal. Its behavior and the associated phenomena while it was over Nyasaland and the Rhodesias are examined in some detail; a factual presentation has been followed and although certain comments have been made, no firm conclusions are attempted. *Subject Headings:* **1. Tropical cyclones 2. Cyclone tracks 3. Indian Ocean 4. South Africa.**—*Author's abstract.*

12N–267 551.515.13:551.4

Funke, P. W., **Movement of mountain lows.** (In: Visscher, H. B. et al., **Development of practical, short-range, weather prediction techniques.** Atlanta, Georgia, Eastern Air Lines, Dec. **1955.** p. 5–16. 11 figs.) **DWB** (M09.3 EL3d)—This study is a partial revision of previ

s work on this category of cyclones (SHAFER and FUNKE, 1954. (For abstract, *see* 6.9–172, pt. 1955, *Met. Abs.*) It presents a supplement to obtain a more accurate easterly component of tion to the surface cyclone under 500 mb conditions. The changes on this type of cyclone were ade evident by data samples taken from winters of 1951–52, 1952–53, 1954–55 with winters of 949–50 and 1953–54 being used as an independent check. These data appear as an appendix to e study. The method evolved corrected some large errors obtained in the previous study and finitely improves the eastward component of motion for cyclones west of 95° long. Sample work eets are included as a guide for the forecasters. *Subject Headings:* **1. Short range forecasting chniques 2. Cyclone movement.**—*E.Z.S.*

12N–268 551.515.13(58)

Komissarova, L. N., **Povtoriaemost' iuzhnykh tsiklonov nad Sredneĭ Azieĭ i Kazakhanom.** [Recurrence of southern cyclones over Central Asia and Kazakhstan.] *Alma-Ata, azakhstan, Kazakhskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy,* No. 5: 6–121, 1955. 3 figs., 2 tables, 5 refs. Review by N. V. Burkova in *Meteorologiia i Gidrologiia,* eningrad, No. 2:52–53, Feb. 1956. **DWB**—After a short review of other works on the formaon of cyclonic disturbances over Central Asia, the author states that the aim of the present work to establish the fact of recurrence of southern cyclones and their frequency. As basic data for e investigation, the synoptic charts for the period 1939–1957, were used. The author gives a tailed description of the analysis and the results obtained. In the period of 13 yrs, 518 cyclones ere investigated. Their yearly distribution was uneven. All cyclones were grouped into six pes, according to the origin of their formation. Recurrence of each type was investigated and e results are shown for each month of the years in %. It is stated that for only 30% of cases the southern cyclones, has rhythmic recurrence been established. *Subject Headings:* **1. Cyclone equencies 2. Central Asia 3. Kazakhstan, U.S.S.R.**—*B.J.G.*

12N–269 551.515.13

Vorob'eva, E. V., **K voprosu o peremeshchenii tsiklonov.** [The problem of cyclone disacement.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy,* No. 65(127):93–97, 56. fig., 5 tables, 10 refs. **DLC**—The steering current rule, that is, the rule of the movement baric structures in the direction of general transport of air in the mean troposphere is examined the basis of an analysis of 75 cyclones during the various stages of their development. The sults of the study show: (1) In forecasting the direction of movement of cyclones it is best to e the AT-700 mb map. (2) Independent of the stage of development, most of the deviations are the right of the isohypse of AT-700 mb, passing through the center of a cyclone. (3) The gle of deviation to the right is about twice as large as that to the left (on the average 46° and °, respectively). (4) On different days of the life of a cyclone its deviation from the AT 700 isohypse is different. (5) The magnitude of the angle depends upon the season: during the nter, deviation to the right is largest, and to the left is smallest. (6) The angle of deviation pends also upon the direction of the isohypse itself. *Subject Headings:* **1. Cyclone displaceent 2. Cyclone forecasting.**

12N–270 551.515.13(477)

*Bogatyr', L. F., **Traektorii tsiklonov na territorii Ukrainy.** [Cyclone trajectories over the kraine.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskii Institut, Trudy,* o. 7:15–36, 1957. 18 figs., 7 tables, 18 refs. **DWB**—The aim of the present article is the conleration of basic trajectories of cyclones passing over the Ukraine, their recurrence (seasonal d monthly), and the circulation conditions at the time of occurrence. The study of the charteristics of cyclone movement is of interest, not only for investigation of atmospheric circulation a factor of climatic peculiarities, but also for weather forecasting. The data, used as a basis r the present investigation, consisted of synoptic charts and maps of pressure topography for the riod 1941–1952. During that period the movements of 291 cyclones were recorded; 88 of these ere formed within the territory of the Ukraine. Three groups of cyclones were considered and trajectories were analyzed. *Subject Headings:* **1. Cyclone trajectories 2. Ukrainian S.S.R.** *B.J.G.*

12N–271 551.515.13(47)

Gavrilova, V. M., **O smeshchenii tsiklonov v oblast' kholoda.** [Displacement of cyclones o the cold region.] *Meteorologiia i Gidrologiia,* Leningrad, No. 4:24–25, April 1958. 3 tables, refs. **DWB, DLC**—The paths of cyclones over European U.S.S.R. were investigated for nine nths of 1953 and out of the 235 cyclones recorded, 47 moved toward the cold region. Data e presented on the monthly distribution of the number of cyclones investigated, and the number cyclones moving to the cold region, number of cases of different deviation computed from actual

pressure, and the variation of temperature aloft and atmospheric pressure at the surface for M 9–10, 1953. It was found that cyclones move to the cold region under the following condition (1) When the sum of the pressure change under the cold region and the initial pressure is l than the pressure change and the initial pressure under the heat region, causing cyclones to mo toward that side where the sum of initial pressure and pressure change is a minimum; (2) Wh positive temperature change (heat advection) is observed in the layer from the Earth's surfa to the level of zero pressure change; and (3) when the pressure in the heat region is considerab higher than in the cold region during uniform heat advection in both regions. Hence, advecti of heat from the Earth's surface to layer of zero pressure change and initial pressure magnitu is the principal factor in the movement of cyclones to the cold region. *Subject Headings:* **1. C clone-cold air relationships 2. Cyclone movement 3. European U.S.S.R.**—*I.L.D.*

12N–272 551.515.13(98

Walden, Hans (*Hamburg-Rissen, Tinsdaler Kirchenweg 233a*), **Ein Tief mit Warmsekt über der Grönlandmassiv.** [A low with a warm sector over the Greenland Massif.] *Ze schrift für Meteorologie,* Berlin, 12(4/6):147–154, April/June **1958.** 7 figs., table, 26 re **DWB, DLC** Free transl. into English in Putnins, Paul and Schallert, W. et al, **Some me orological and climatological problems of the Greenland Area.** U. S. Weather Bureau, Cc tract DA-3-99-04-112, Final Report, issued Dec. **1959.** p. 188a–188g. **DWB.**—The author views the scientific literature on the problem of whether cyclones cross Greenland, and the alte tions experienced by air masses in their passage across Greenland. This is followed by the descr tion of a situation which, from the observations of the French scientific station "Victor" and fr coastal observations, indicates that a cyclone traversed the Greenland massif. During April 12–1 1950 wind and pressure observations indicated the passage of a cyclone. The passage of the wa front was not very marked, but the snowfall increased and the temperature rose, so that a 20 warming occurred in 24 hrs. The As cloud cover dropped to 300 m. The passage of the c front occurred on the same day (April 13); the wind rotated to the west and the As was repla by a loose Sc whose lower boundary lay at 710 m; the barometer rose and the air temperat fell from — 21.7° to — 51°C. The synoptic situation was marked by the presence of a low the west coast of northern Greenland at Upernavik; it possessed a distinct cold front (April 1 The next day the low disappeared over the Greenland massif but its passage was determined fr the observations at station "Victor." It crossed Greenland at an average velocity of about km/hr. Data giving the meteorological observations at "Victor," and synoptic maps showing weather situation on April 12 and 13, 1950, absolute topography at 500 mb on April 13, the cen of the high aloft at the 500 mb level, etc. are presented. *Subject Headings:* **1. Cyclone mov ment 2. Circumpolar cyclones 3. Arctic air circulation 4. Greenland.**—*I.L.D.*

Tropical Cyclones, Hurricanes, Typhoons (551.515.2)

Tropical Cyclones

12N–273 551.515.2(493,4

§Sneyers, R. and Defrise, P., **La tempête du 6 au 7 novembre 1952.** [The storm of Nov and 7, 1952.] *Ciel et Terre, Uccle,* 69(1/2):23–30, Jan./Feb. **1953.** 2 figs., 3 tables, ref.—D scription of a cyclonic storm and accompanying meteorological and synoptic conditions, which c a great deal of damage in Belgium. Winds reached 55–60 km/hr at the surface and 200 km/ aloft (over Scotland). *Subject Headings:* **1. Cyclonic storms 2. Belgium 3. Scotland.**—*M.*

12N–274 551.51

Cyclone, South Indian Ocean. *Marine Observer,* 25(168):96–97, April **1955.**—Obser tions on M.V. *English Star* in about 33°S, 85°E on April 14, 1954. *Subject Heading:* **1. Tropi cyclones.**—*C.E.P.B.*

12N–275 551.515.2:551.466.45:551.35

Mahadevan, C. and Srirama Das, A. (*both, Andhra Univ.*), **Effects of high waves on t formation of coastal black sand deposits.** *Andhra Univ., Maltair, India, Memoirs in Ocean raphy,* 1:57–62, **1954.** 3 tables, 9 refs. **DLC** (GC1.A55)—In Dec. 1951, after a cyclonic sto of severe intensity, centered about 650 mi southeast of Vizagapatam, the normal wave hei (breaker) increased from 2 to 12 ft, and large deposits of well sorted black sand were encounte along the Vizagapatam beach. The conclusion drawn is that during retrogradation, with incre ing wave height, the white sand is replaced patchwise by the black sand. *Subject Headin* **1. Cyclonic storms 2. Breakers 3. Sand transport.**—*W.N.*

12N–276 551.515.21

Gherzi, Ernest, **Methodology in the study of the origin and motion of tropical cyclones.** n: Caribbean Hurricane Seminar, Ciudad Trujillo, Feb. 1956, **Final Report of the Seminar,** b. **1956.** p. 19–33. 21 refs.] **DWB**—Attempts of the ancient Chinese to explain and fore- st the path of cyclones are outlined. The thermal explanation for tropical cyclones was accepted til the frontal theory seemed to be more acceptable; however in the Far East it was observed t there was no front present in the cyclones. Later, the air stream method and triple point uations aroused interest. The easterly waves technique is described. The new aerological data ve not destroyed the plausibility of the thermal theory. *Subject Heading:* **1. Tropical cyclone eories.**—*E.Z.S.*

12N–277 551.509.57:551.515.2:061.6(691)

Frolow, S. (*Madagascar Met. Service*), **Meteorological service and the study of cyclones Madagascar.** (In: Caribbean Hurricane Seminar, Ciudad Trujillo, Feb. 1956, **Final Report the Seminar,** pub. **1956.** p. 238–242.) **DWB**—Despite inadequate facilities and paucity of a, methods have been developed which help in the forecasting of cyclones. The ideas of Prud'- mme and Bauer are accredited. The author analyzes pressure fields on the basis of the spatial nensional criterion of perturbations. This method makes use of the deformation, caused in a d by a disturbance whose scale is of an order of magnitude greater than that of the correspond- normal field. *Subject Headings:* **1. Tropical cyclone forecasting 2. Madagascar.**—*E.Z.S.*

12N–278 551.515.2:551.556.1(729.3)

García Bonnelly, Juan Ulises (*Engineer, Dominican Republic*), **Cyclones which caused dam- e on the Island of Hispaniola.** (In: Caribbean Hurricane Seminar, Ciudad Trujillo, Feb. 56, **Final Report of the Seminar,** pub. **1956.** p. 243–251) **DWB**—A chronological list of clones since 1494. Several are annotated. *Subject Headings:* **1. Tropical cyclones 2. Do- nican Republic.**—*E.Z.S.*

12N–279 551.515.2:551.524

Kopcewicz, Teodor, **Le rapport entre la répartition de la température de l'air et la vitesse ns le tourbillon curculaire, stationnaire, horizontal.** [Relation between the distribution of nospheric temperature and velocity in a circular, stationary and horizontal vortex.] *Acta Geo- ysica Polonica,* Warsaw, 5(1):11–21, **1957.** 2 figs., 5 refs., 21 eqs. **DWB, DLC**—After out- ing known relations for distribution of pressure in a sationary circular horizontal vortex, a neral expression is established for the distribution of air temperature in a plane horizontal to vortex. Stationary circular vortexes are classified according to the vertical distribution of gular velocity and vertical temperature gradient. In the general formula for $\delta T/\delta r$ the ac- pted values for variation of geostrophic wind with height were used (T = vertical temperature air, r = radius or distance from center of vortex). The treatment is applied to special cases, h as cold core cyclones, very intense cyclones, barotropic cyclones, isothermal cyclones and ticyclonic vortexes. *Subject Headings:* **1. Vorticity theories 2. Temperature-wind velocity ations in vortexes 3. Vortex dynamics.**—*M.R.*

12N–280 551.515.2:551.513.1(261)

Ballenzweig, Emanuel M. (*U. S. Weather Bureau, Wash., D. C.*), **Formation of tropical rms related to anomalies of the long-period mean circulation.** *U. S. Weather Bureau, tional Hurricane Research Project Report,* No. 21, Sept. 1958. 16 p. 10 figs., 13 refs. **DWB** [15.2 U5845r No. 21)—By using composite charts of time averaged means, many details of the e of the large scale circulation in influencing the generation of tropical cyclones are brought o focus. First, a contrast is shown between generally propitious and inhibiting conditions for nesis in the broad area of the North Atlantic. Next, the formation of tropical storms is shown be concentrated in five areas in the Atlantic and the longer period circulation features accom- nying tropical cyclogenesis in these areas is discussed with the help of a series of charts con- ning rather clearcut anomalous features. Conditions favorable for the formation of tropical rms are found to differ among the different areas. The composite charts appear to be useful as ides in the preparation of long range forecasts of hurricane formation, once the mean circula- n has been predicted. *Subject Headings:* **1. Atmospheric circulation anomalies 2. Tropical clone formation 3. Hurricane forecasting 4. North Atlantic.**—*Author's abstract.*

12N–281 551.515.2

Faust, Heinrich (*Offenbach*), **Tropische Wirbelstürme.** [Tropical cyclones.] *Naturwis- schaftliche Rundschau,* Stuttgart, 11(5):185, May **1958. DLC**—As yet unsolved factors in- ved in the development and movement of hurricanes are discussed, in particular the problem of formation of the eye. The sinking of the null layer to the Earth's surface is suggested as a

possible mechanism of hurricane eye formation. Wind measurements in hurricane "Betsy" Aug. 13, 1956 are consistent with this hypothesis. *Subject Headings:* **1. Tropical cyclones Eye of hurricane 3. Hurricane "Betsy" (1956).**—*G.T.*

12N–282 551.515.2(26

Hollingdale, R. G., **Tropical cyclone in the South Pacific Ocean. (Reported from t M. V. Hauraki, Auckland to Panama, Feb. 27, 1957.)** *Marine Observer,* London, 28(179) :1 14, Jan. **1958. fig. DLC**—Records of a tropical cyclone in the South Pacific Ocean have be collected from the M. V. "Hauraki" as she piled between Auckland and Panama Feb. 27–Mar 2, 1937. On Feb. 27 at 085 GMT warning was received from Wellington of the tropical cyclo at approximately 21°30′S, 178°E, moving SW at 10 knots, and with a central pressure of 985 m Other records of wind velocity, intensity and direction are included. In general, gales of 50 kn were encountered by the "Hauraki" throughout the period. The data observed were sent to t Director, New Zealand Meteorological Service. *Subject Headings:* **1. Tropical cyclone recor 2. Pacific Ocean.**—*N.N.*

12N–283 551.515.21 :551.511.

Jordan, Charles L. (*Florida State Univ.*), **The thermal structure of the core of tropi cyclones.** *Geophysica, Helsinki,* 6(3/4) :281–297, **1958.** 7 figs., 2 tables, 18 refs. **DWB, DL** —Recent data relating to the temperature field in and near the eye of tropical cyclones are p sented and compared with the mean cross section prepared by Palmén. Mean eye soundings f tropical cyclones of several intensities have been prepared from dropsonde data and profiles of t horizontal temperature field have been prepared for selected cases from aircraft observatio Systematic deviations from the mean cross section are considered for storms of different intensi *Subject Headings:* **1. Thermal structure of tropical cyclones 2. Eye of tropical cyclones.** *Author's abstract.*

12N–284 551.51

Riehl, Herbert (**Dept. of Met., Chic. Univ.**) and Gentry, R. C. (*Nat. Hurricane R Project, West Palm Beach, Fla.*), **Analysis of tropical storm Frieda, 1957: a preliminary repo** *U. S. Weather Bureau, National Hurricane Research Project Report,* No. 17, June **1958.** 16 13 figs., 5 refs. **DWB** (M15.2 U5845r)—A discussion and analysis of the development of tropi storm "Frieda" in the Cuban area (27°–32°N, 64°–72°W), during Sept. 21–23, 1957. Cha show track of storm, and of research aircraft (2 B-50's and 1 B–47), and profiles of wind spe surface isobars and 1200 ft streamlines, sea surface temperature, anomalies in 5° squares duri formation, 100–500 mb thickness Sept. 23, 1957, 250 mb streamline isotachs and isotherms 35,000 ft for B-47 flight on Sept. 23, 1957, etc. It is concluded that the storm was carried superposition of a high level trough upon a surface center of low pressure and cyclonic rotati supporting theory of Riehl and Simpson. The two circulations were previously independe *Subject Headings:* **1. Tropical cyclone "Frieda" (1957) 2. West Indies.**—*M.R.*

12N–285 551.515.2 :551.465.755(9

Whittingham, H. E. (*Bureau of Met., Brisbane*), **The Bathurst Bay hurricane and ass ciated storm surge.** *Australian Meteorological Magazine,* Melbourne, 23 :14–36, Dec. **1958.** figs., 2 tables, 6 refs. **DWB**—The Bathurst Bay cyclone of 1899 in North Queensland was t worst ever experienced in the state in regard to loss of life and shipping. This paper is a revi of an early and well documented account of the cyclone in the light of some modern analyti techniques, including reconstruction of time sections and consideration of the storm surge effe *Subject Headings:* **1. Cyclone, Bathurst Bay (1899) 2. Storm surges 3. Bathurst Ba Queensland, Australia.**—*Author's abstract.*

12N–286 551.51

Thom, H. C. S. (*Office of Clim., U. S. W. B., Wash., D. C.*), **The distribution of annu tropical cyclone frequency.** *Journal of Geophysical Research,* Wash., D. C., 65(1) :213–22 Jan. 1960. 4 figs., 9 tables, 9 refs., 11 eqs. **DWB, DLC**—In preparation for studying and fitti tropical cyclone frequency distributions, certain time trends in the climatological series are test statistically and explanations of their possible cause proposed. The annual frequency of tropi cyclones and hurricanes are hypothesized to be rare event type series. On the basis of physical a statistical principles it is shown how the Poisson and negative binomial distributions are adapt to fitting the climatological series under prescribed physical conditions. These distributions a shown to provide good statistical fits and therefore good estimates of probabilities of annual cyclo frequency. Where necessary, the effects of trend are removed and corresponding adjustme made in the distribution parameters. *Subject Headings:* **1. Tropical cyclone frequency di tribution 2. Annual cyclone frequencies.**—*Author's abstract.*

12N–287 551.515.2(94)

Australia. Bureau of Meteorology. **Occurrence of tropical depressions and cyclones in north eastern Australian region during the seasons 1958–1959.** Prepared by Forecasting ion, Divisional Office, Brisbane. *Australian Meteorological Magazine,* Melbourne, No. 26:50–Sept. 1959. 3 figs., 4 refs. **DWB**—During the year ended June 30, 1959 there were only tropical disturbances which were associated with gale force winds. Of these, the Feb. 1959 one was the third most intense on record. This storm was associated with a central pressure 948 mb (28.00 in.) and 116 mph winds lasting for about 2 hrs at Bowen. This cyclone could ost be described as "classical" in regard to its behavior in relation to the various forecasting . Concerning these, the cyclone season confirmed previous experience in regard to the value certain aids. Those found to be of particular value were sferics for detection; radar for king; divergence on the warm side of the 200 mb jet and the "Durst Sutcliffe" effect for elopment; Mintz's rule for steering when a horizontal temperature gradient was clearly estab-ed; and the 200 mb zonal discontinuity whenever the disturbance was clearly to one side or other of the discontinuity. The season gave increasing evidence of the fact that there appears e a direct relationship between the strength of the 200 mb jet and the intensity and speed of pening of the surface disturbance. When cyclones were well developed it was possible to fore-direction of movement with a fairly high degree of accuracy, but some difficulties were evident his respect in the case of the smaller and weaker disturbances. *Subject Headings:* **1. Tropical urbances 2. Depressions 3. Northeastern Australia.**—*Author's abstract.*

12N–288 551.515.2(914)

Philippines. Weather Bureau. **Tropical cyclones.** maps, tables, charts. Issued annually. est issue seen: 1960, pub. [1961?] **DLC** (QC948.P53), **DWB** (M15.2 P552t)—Tracks of all ones, history of each, maximum 24-hr rainfall whenever it occurred, maximum winds over and sea, damage to highways and bridges, crops and human casualties, and forecasts issued he Philippines Weather Forecasting Center are given. *Subject Headings:* **1. Typhoons 2. hoon statistics 3. Western Pacific 4. Philippine Islands.**—*M.R.*

Hurricanes

12N–289 551.515.2

Rossmann, F., **Unmittelbare Sinneseindrücke beim Durchzug eines Hurrikans.** [Im-iate sensations on the passage of a hurricane.] *Meteorologische Rundschau,* 7(1/2):23, Jan./ 1954. **DWB**—Description of weather experienced by the author in a weak to moderate icane on the coast of Florida. The intensity of the rain was especially noteworthy. *Subject ding:* **1. Hurricane weather.**—*C.E.P.B.*

12N–290 551.515.23(261)

Jordan, Harold M. and Stowell, David J. (*both, U. S. W. B., Wash., D. C.*), **Some small-e features of the track of hurricane Ione.** *Monthly Weather Review,* 83(9):210–215, Sept. 5. 4 figs., 4 refs., eq. **DWB**—The behavior of the eye of "Ione" for about 35 hrs while it under radar observation at Hatteras, N. C., and while the center was in an area of many ace observing stations, is described. An analysis of two sets of pressure oscillations observed e it was within range of Hatteras is presented. It is shown that in a slow moving storm with rotational velocity the position of the eye as determined by radar is almost identical with position indicated by a synoptic isobaric analysis; but in a fast moving storm with low angular city Shaw's computations for a normal cyclone should be considered. Apparent track of the icane and position of the eye of the hurricane, Sept. 18–20, 1955, as determined by radar ; and hourly analysis with 1-hr pressure changes near the center of the hurricane, are pre-ed. *Subject Headings:* **1. Hurricane "Ione" (1955) 2. Hurricane tracks, Atlantic coast adar hurricane tracking 4. Hatteras, N. C.**—*I.L.D.*

12N–291 551.515.23

Rodewald, Martin, **Der unzeitgemässe Hurrikan Alice.** [The untimely hurricane "Alice."] *terlotsė,* No. 83:26–34, Feb. 1955. 2 figs. **DLC**—Account of the W. Indian hurricane of 29, 1954–Jan. 4, 1955, when the season should be over. Track first ran SW then turned *Subject Headings:* **1. Hurricane "Alice" (1955) 2. Hurricane tracks.**—*C.E.P.B.*

12N–292 551.515.2:662.2:539.1

Schuuring, C., **Atoomexplosies en weersgesteldheid.** [Atomic explosions and weather con-ns.] *Hemel en Dampkring,* The Hague, 53(7):139–140, July 1955. fig.—This is a sum-of studies on the relationship between atomic explosions, and weather, especially the possible of atomic explosions upon the incidence of hurricanes. Mention is made of the study of

Lee Harris and a map showing the paths of the 1954 hurricanes in the Caribbean is reproduc
Subject Headings: **1. Atomic explosion effects on weather 2. Atomic explosion—hurric
relationships 3. Caribbean Region.**—*I.L.D.*

12N–293 551.5

Van der Bijl, Willem, **Wie doopte deze zomer Connie?** [How was "Connie" named summer?]. *Hemel en Dampkring,* The Hague, 53(11):208, Nov. **1955. DLC, DWB**—A b account of the procedure employed by the U. S. Weather Bureau to assign names to hurrica It is based upon a statement issued by Norman Hagen of the U. S. W. B. *Subject Headi* **1. Hurricane names.**—*I.L.D.*

12N–294 551.515.2(729.3)

Cambiaso V., Juan B., **A century of Dominican cyclonology: period from 1851 to 19** (In: Caribbean Hurricane Seminar, Ciudad Trujillo, Feb. 1956, **Final Report of the Semi** pub. **1956.** p. 105–108) **DWB**—The lecture contains abstracts from the author's book **A C tury of Dominican Cyclonology.** 335 cyclones and hurricanes occurred during the period 18 1935. At least one or two cyclones were registered yearly. An annotated list of notable cyclo in Santo Domingo from 1851 to 1951 is included. *Subject Headings:* **1. Hurricanes 2. Trop cyclones 3. Dominican Republic.**—*E.ZS.*

12N–295 551.51

Dunn, Gordon E. (*Miami Hurr. Warning Center, USA*), **Hazel hurricane.** (In: Caribb Hurricane Seminar, Ciudad Trujillo, Feb. 1956, **Final Report of the Seminar,** pub. **1956.** p. 2 222. 5 figs., 12 refs.) **DWB**—Hurricane "Hazel" is described from its start on Oct. 4, appare over the Windward Islands. The hurricane's track, through the Carolinas, and on to Canada well as its final stages in the North Atlantic, are detailed. *Subject Headings:* **1. Hurric tracks 2. Hurricane "Hazel" (1954).**—*E.Z.S.*

12N–296 551.5

Gentry, Robert C. (*Miami Hurr. Warning Center, USA*), **Objectives and basic design the National Hurricane Research Project.** (In: Caribbean Hurricane Seminar, Ciudad Truj Feb. 1956, **Final Report of the Seminar,** pub. **1956.** p. 255–264. fig., 12 refs.) **DWB**— program, beginning in May 1956, is planned to continue for a minimum of 4 or 5 yrs. The collection and aircraft investigation programs are designed to permit the testing of a number working hypotheses concerning hurricane inception, movement, and development, but are desig primarily for the collection of information needed to accomplish the following objectives: 1) ascertain what makes hurricanes form and move, i.e., the energy budget of the hurricane; 2) to determine important parameters in forecasting and how these can best be observed by airc and other means. *Subject Headings:* **1. National Hurricane Research Project 2. Hurric research.**—*E.Z.S.*

12N–297 551.51

Grace, Robert J. (*WBAS, San Juan, Puerto Rico*), **Betsy's roving eye.** *Monthly Wea Review,* Wash., D. C., 84(8):311–312, Aug. **1956.** fig. **DWB, DLC**—A brief account of sinusoidal motion of the narrow (8–18 mi) eye of "Betsy" (Aug. 11–12, 1956) as it moved W across the Caribbean. This phugoid motion was broken up when the hurricane turned NW came within the influence of the Virgin Islands and Puerto Rico. There the eye varied from 6 mi in diameter. Damage in Puerto Rico was estimated at $25 million, mainly to agricult Only 9 people were killed due to early warnings, but 12,000–15,000 were homeless at Yabu alone. Radar fixes each ½ hr from 0500 to 1730 Aug. 12 are shown on chart. Path diagon across Puerto Rico was erratic, due to high terrain. *Subject Headings:* **1. Hurricane "Be (1956) 2. Sinusoidal motion of hurricane eye 3. Eye of hurricane 4. Hurricane dam 5. Puerto Rico.**—*M.R.*

12N–298 551.5

***Hurricane Flossy, September 21–28, 1956: (a preliminary report).** *U. S. Weather reau, Weekly Weather and Crop Bulletin,* 43(40a):1–4, Oct. 1, **1956.** fig., 2 tables. D **DLC, DA**—Hurricane "Flossy," the first hurricane of the season to hit the U. S., entered Mississippi River Delta and swept across the southeastern coastal area. Its highest winds estimated at between 90 and 110 mph. Heavy storms and tornadoes developed in various pl Onshore winds brought above normal tides and wave action to the coastal towns. Detail "Flossy's" track are mapped and data are given in chart form for all the states affected. *Su Headings:* **1. Hurricane "Flossy" (1956) 2. Hurricane tracks 3. Mississippi River D** —*N.N.*

12N–299 551.515.2

Fultz, Dave and Kaylor, Robert, **Experiments with thermally produced vortices.** Chicago. . Dept. of Meteorology, Contract Cwb-8702, Final Report, Nov. **1957.** 16 p. 13 figs., 12 **DWB**—Through the use of local heating and cooling, it is possible to produce a laboratory ogy to a tropical storm. The initial experiments with such a vortex are presented, together cross sections of temperatures, velocities, and pressure fields, and the corresponding data a composite hurricane. The uses of the model and proposed lines of future investigation discussed. *Subject Headings:* **1. Hurricane models 2. Laboratory vortexes.**—*Author's act.*

12N–300 551.515.2:551.556.1

Hurricanes and tropical storms 1887–1956. *Weatherwise, Boston,* 10(4):132–133 and 139, **1957.** table. **DWB** (Reprinted from *U. S. W. B. Weekly Weather and Crop Bulletin,* 1, 1957)—Year by year data for total number of hurricanes and tropical storms in all areas tlantic; number reaching U. S. coast; loss of life in all areas and in U. S.; and damage in reas and in U. S. *Subject Headings:* **1. Hurricane statistics 2. Hurricane damage.**—*M.R.*

12N–301 551.515.22

Jordan, Charles L., **Mean soundings for the hurricane eye.** *U. S. Weather Bureau, Nal Hurricane Research Project Report,* No. 13, Sept. **1957.** 10 p. 3 figs., 2 tables, 5 refs. B (M15.2 U5845r)—Mean soundings to 500 mb for the hurricane eye based on 39 dropsondes 955 and 1956, are presented and discussed for weak, moderate, and intense hurricanes, respecy, and samples of each type taken from recent individual Caribbean hurricanes are included. ndings in the eye and in the rain area for hurricane "Betsy" (1956) are analyzed and comd with the mean soundings. In general, a tendency toward warmer temperatures aloft at all s is found with increasing intensity of hurricane. *Subject Headings:* **1. Eye of hurricane urricane "Betsy" (1956) 3. West Indies.**—*M.R.*

12N–302 551.515.2:551.509.313

Kasahara, Akira, **Method for solving the balance equation with the relative vorticity as rrying parameter.** Chicago. Univ. Dept. of Meteorology, Contract Cwb-9016, Technical rt, No. 3, March **1957.** 11 p. 8 figs., 10 refs., 29 eqs. **DWB** (M15.2 G532te)—It is n that the stream function for nondivergent flow may be computed from the height contour with the use of the balance equation There are essentially two different computation schemes able; in the first, the successive approximation of the solution is carried by the stream func in the second, it is carried by the relative vorticity and the stream function is obtained from vorticity field by the ordinary relaxation method. If the relative vorticity is chosen as a ing parameter, the number of iterations involving nonlinear operations may be reduced conably compared with the first scheme, and eventually this may reduce the computing time red for the solution. Based upon the second scheme, a practical method for solving the ce equation which is suitable for numerical calculations using an electronic computer is nted. One example is computed by hand using a 10×10 grid mesh with 300 km grid dis which is placed over the 500 mb height contour map of a hurricane. *Subject Headings:* **alance equation 2. Numerical forecasting of hurricanes.**—*Author's abstract.*

12N–303 551.515.2

Krueger, Daniel W. (*U. S. W. B.*), **Relation between the mass circulation through hurris and their intensity.** Chicago Univ., Dept. of Meteorology, Dec. **1957.** 12 p. 10 figs., bles, 6 refs. **DWB** (M15.2 U587re) Also issued in: *American Meteorological Society, tin,* 40(4):182–189, April **1959.** 9 figs., 2 tables, 7 refs. **DWB, DLC**—Surface winds ved by ships in the vicinity of hurricanes are examined to determine whether there is a onship between the mass circulation through a storm and its intensity. The available cases ate that the central pressure is inversely proportional to the mass inflow. *Subject Heading:* **urricane mass circulation-intensity relationships.**—*Author's abstract.*

12N–304 551.515.2(73)

Metropolitan Life Insurance Co., **Hurricanes—past and present.** Its *Statistical Bulletin,* -8, July **1957.** table. **DWB, DLC**—The major hurricane targets in the U. S. are the tic and Gulf states. "Audrey" was the first hurricane of 1957, striking in June. It swept s La. and eastern Tex., then shifted northward, having concentrated its fury on the Gulf s. Two other severe, June hurricanes hit the U. S. 1926–1956, during which period this ry had 49 such storms. 37 of these occurred in Aug. or Sept., 6 in Oct., 3 in July, 2 in and only one in Nov. *Subject Headings:* **1. Hurricane statistics 2. United States.**—*N.N.*

12N–305 551.515.2:629

Rodewald, Martin, **Ausweichen vor einem Hurrikane an der Küste von Niederkaliforni 3.–4. October 1957.** [Avoiding a hurricane on the coast of Lower California, Oct. 3–4, 195 *Der Wetterlotse,* Hamburg, No. 124:242–244, Nov. **1957.** fig. **DWB**—This is a report on maneuvering of the ship "Gannstein" by CAPTAIN HILLMANN, on a trip from Los Angeles Balboa on Oct. 2–4, 1957 to avoid a hurricane on the Lower California coast. *Subject Headin* **1. Navigation in hurricanes 2. Lower California Coast.**—*A.M.P.*

12N–306 551.515.2:656.61(2

Rodewald, Martin, **Bericht über die umfahrung eines Mauritius Orkans auf Grund v Wettermeldungen.** [Report on the sailing round of a Mauritius hurricane on the basis weather warnings.] *Wetterlotse,* no. 120/121:153–160, July/Aug. **1957.** fig. **DLC**—Descri a report of 2nd Officer TEETZ of the "Waldemar Peter." Owing to closure of Suez canal course NE of Mauritius was necessary. Different hurricane warnings were received fr Mauritius and Tananarive. Reports, path of hurricane and ship's track are given from J 18–23, 1957. *Subject Headings:* **1. Hurricanes 2. Navigation in hurricanes 3. Indian Oce** —*C.E.P.B.*

12N–307 551.51

Rodewald, Martin, **Erfolgreiches Ausweichen vor Hurrikan Edith (Aug. 1955) durch M "Mai Rickmers."** [Effect of hurricane "Edith" (Aug. 1955) on MS "Mai Rickmers."] *Wett lotse,* No. 120/121:177–180, July/Aug. **1957.** fig. **DLC**—Warning was received on Aug. 1955 of a hurricane forming in 21.4°N, 55.8°W and moving rapidly west. Avoiding action described. *Subject Heading:* **1. Hurricane "Edith" (1955).**—*C.E.P.B.*

12N–308 551.51

Simpson, R. H. (*Director, Nat. Hurricane Research Project*), **National Hurricane Resea Project.** *Mariners Weather Log,* Wash., D. C., 1(4):83–85, July **1957.** fig. **DWB**—N England and the Middle Atlantic States suffered greatly from hurricanes in 1954 and 1955. National Hurricane Research Project was organized shortly afterwards. In 1956 aircraft me ured and recorded winds at different heights up to 35,000 ft. Progress was also made in ra detection, tracking and analysis of hurricanes. In 1957, 3 airplanes were dispatched simultaneou into storms. A device developed cooperatively by the NHRP and the USAF Cambridge Resea Center was also tested in the eye of the hurricanes. The NHRP hopes to collect all the availa meteorological data and conduct series of investigations during hurricane seasons in order determine definitely the cause, source, and course of hurricanes. *Subject Headings:* **1. Natio Hurricane Research Project 2. Hurricane studies.**—*N.N.*

12N–309 551.515.2(7

*Skjelbreia, Lars (*Calif. Res. Corp., La Habra, Calif.*), **Storm data obtained in the Gulf Mexico during the hurricane season 1957.** (In: Technical Conference on Hurricanes, Mi Beach, Fla., Nov. 19–22, 1958, **Proceedings,** issued **1958** (?) Section B4 (15 p.) 18 figs.) **DW** (M15.2 A512pr)—To design offshore structures adequately, a designer needs accurate informat on expected wave height and wave forces at the platform site. This paper includes a sh description of the measuring and recording equipment, the methods used in reducing the data, presents tide and wave data obtained at Bay Marchand, La., during the 1957 hurricane sea *Subject Headings:* **1. Storm data 2. Hurricane research 3. Bay Marchand, La.**—*W.N.*

12N–310 551.515.2(9

U. S. Weather Bureau, Hurricane Nina, Nov. 30–Dec. 7, 1957: a preliminary report the advisories issued by the Weather Bureau at Honolulu, T.H. Dec. 11, 1957. 8 p., ch (on cover). **DWB** (M15.2 U587hni)—A brief report and several pages of advisories issued the Honolulu Weather Bureau Forecast Center from Nov. 30–Dec. 7, 1957, for hurricane "Nin the second hurricane coming close to the Hawaiian Islands in recent years. It came even clo than the one of Aug. 1950. The first signs of the storm were noticed on Nov. 29, near Palm Island, 1000 mi SSW of Honolulu (winds 50 knots and squalls). It reached hurricane force Sunday, Dec. 1. Winds were generally 70 knots with gusts of 90 knots, near the center several days and 90–120 knots on Dec. 4, 300 miles NE of Johnston Island, decreasing to 30 kn by Dec. 7. Winds of 80 knots were observed at Kanai on Dec. 1; waves there reached 35 ft 20.41″ rain fell in 14 hrs that day at Honolulu airport. Gusts of 71 knots Nov. 30 set a rec *Subject Headings:* **1. Hurricane "Nina" (1957) 2. Hawaiian hurricanes 3. Record rain Kanai, Hawaii 4. Hurricane advisories 5. Kanai, Hawaii 6. Hawaiian region.**—*M.R.*

12N–311 551.515.2(729)

U. S. Weather Bureau. Office of Climatology (*comp.*), **West Indian Hurricanes.** *Mariners ather Log,* Wash., D. C., 1(4):73–83, July **1957.** 7 figs., table **DWB**—A West Indian hurri- e is a tropical cyclone with winds of 65 knots or more. The four very active regions of m development are: the Atlantic east of the Lesser Antilles, the Western Caribbean Sea, the f of Mexico and the Atlantic east of Southeastern Florida. Any hurricane moves in the direc- of the prevailing winds of the particular area. Its wind system is more or less circular, with omparatively calm center. Its strongest winds are near the center and to the right of the k. In some of the greatest hurricanes the diameter of the area of destructive winds may as much as 400 to 500 mi. In 1956 the average annual frequency of tropical storms was 7.9. *ject Headings:* **1. West Indian hurricanes 2. West Indies.**—*N.N.*

12N–312 551.515.2:551.461.2(757)

*Zetler, Bernard D., **Hurricane effect on sea level at Charleston.** *American Society of Civil gineers. Hydraulics Div., Journal,* HY4 (ASCE Proceedings, Vol. 83, Paper 1330), Aug. 7. 19 p. 2 figs., 8 tables, 2 refs. **DLC**—All tropical cyclones coming within 300 nautical of Charleston, S. C. (5° of lat.) between 1922 and 1955 were segregated according to whether rleston was on the left or the right side of the cyclone track. Tide records were examined data tabulated as to octant, length of path, duration, speed, distance at closest point to rleston, maximum displacement of sea level and maximum height of tide. No positive relation- ps could be discovered from the study as there are too many variables. Cases are discussed vidually according to the octant in which Charleston lay. Sometimes an extreme low tide ows soon after the maximum storm tide. *Subject Headings:* **1. Hurricane tides 2. Hurricane a 3. Hurricane effects on water level 4. Charleston, S. C.**—*M.R.*

12N–313 551.515.2

Behrendt, Ernst, **What science is discovering about hurricanes.** *Popular Science Monthly,* (3):99–101, 264, 266, Sept. **1958.** fig. **DLC**—Recently acquired knowledge on the formation, vement and structure of hurricanes and possible means of controlling them are outlined. A ng hope among U. S. Weather Bureau scientists that more knowledge of the properties of ricanes ultimately might lead to their control is noted. *Subject Heading:* **1. Hurricane re- rch.**—*G.T.*

12N–314 551.515.2:551.509.6

Braham, R. R., Jr. (*Univ. Chicago*), **An exploratory experiment in hurricane seeding.** : Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings,** ed **1958** (?) Section D6 (8 p.) table, ref.) **DWB** (M15.2 A512pr)—A discussion of some the more general aspects of hurricane seeding. Seeding of hurricanes must be regarded as ctly in the experimental stage. An Australian silver iodide generator was modified for use on National Hurricane Research Project B-50 planes, and this unit was installed and operated ing the 1958 season. Due to its unsatisfactory performance, only a single seeding experiment carried out during that season. Certain general arguments serve as a guide to hurricane ding research. On the basis of these premises, the conclusion is reached that the most effective to seed cumulus clouds, with the high-output generators, is not to release the seeding material nin the cloud, but to release it outside the cloud, preferably at low levels, so that it will be jected to a maximum amount of horizontal dilution before it is incorporated into the updraft es of the cumulus clouds. *Subject Heading:* **1. Hurricane seeding.**—*W.N.*

12N–315 551.515.23(09)

Davis, Walter R. (*U. S. W. B., Miami, Fla.*), **Hurricanes.** *Mariners Weather Log,* Wash., C., 2(4):103–106, July **1958. DWB, DLC**—The breeding, location and time of hurricanes the advance indications of the approaching storm are explained. Brief history of the hurri- es of Sept. 1926, Labor day 1935, and Sept. 1947 are given. New developments in control warning systems are discussed. *Subject Headings:* **1. Hurricane development 2. History urricanes.**—*W.N.*

12N–316 551.515.21

Pfeffer, Richard L. (*Air Force Cambridge Research Center*), **Further examination of the ance of angular momentum in the mature hurricane.** *U. S. Weather Bureau, National rricane Research Project Report* No. 19, July **1958.** p. 1–15. 2 figs., 3 tables, 7 refs., 16 eqs. epared Sept. 30, 1957 in accordance with the Cooperative agreement CWB-9009 between the S. Weather Bureau and the Massachusetts Institute of Technology, dated 16 Oct. 1956.) /B (M15.2 U5845r)—The angular momentum equation for an arbitrary rotating system in

the atmosphere is examined. It is shown that the Coriolis torque serves to redistribute relati angular momentum without altering, to any marked degree, the total amount within the syste In particular, where the action of the Coriolis torque tends to develop a cyclone near the grou it must tend to develop an equally intense anticyclone aloft. In order that a rotational syste such as the hurricane, develop through a considerable depth of the atmosphere, the tendency f an upper level anticyclone to be created by the Coriolis torque must be compensated by a transp of angular momentum into the system. An observational study is presented which shows th in the case of the mature hurricane, both azimuthal mean motions and horizontal eddy proces play important roles in accomplishing this transport. *Subject Headings:* **1. Coriolis force effe on hurricane winds 2. Anticyclogenesis 3. Hurricane dynamics.**—*Author's abstract.*

12N–317 551.515.21:551.5

Pfeffer, Richard L. (*Air Force Cambridge Research Center*), **On the energetics of t mature hurricane and other rotating wind systems.** *U. S. Weather Bureau, National Hur cane Research Project Report* No. 20, July **1958.** p. 1–38. 2 figs., 6 tables, 23 refs., 55 e (Prepared Sept. 30, 1957 in accordance with the Cooperative Agreement CWB-9009 between t U. S. Weather Bureau and the Massachusetts Institute of Technology, dated 16 Oct. 195 **DWB** (M15.2 U5845r)—The first part of this paper is devoted to the formulation and interpre tion of the energy equations as they apply to the study of rotating wind systems of interest meteorology. In a subsequent section, the energy cycles of different rotating systems in t atmosphere are discussed. Finally, the roles of "azimuthal mean motions" and of "horizon eddy processes" in the generation of azimuthal mean kinetic energy in the mature hurricane a examined quantitatively from observational data. As expected, azimuthal mean motions genera significant amounts of mean rotational kinetic energy within the hurricane. However, interactio with the surrounding atmosphere do not cause organized rotational kinetic energy of the hurrica to be dissipated into that of horizontal eddies, as might be expected. According to the obser tions, the reverse is the case; namely, that the hurricane circulation feeds on the energy of t horizontal eddies. *Subject Headings:* **1. Hurricane dynamics 2. Energy of storms.**—*Autho abstract.*

12N–318 551.515.

Malkus, Joanne S. (*Woods Hole Oceanog. Inst.*), **On the structure and maintenance of t mature hurricane eye.** *Journal of Meteorology,* Boston, 15(4):337–349, Aug. **1958.** 3 figs., tables, 20 refs., 3 eqs. **DWB, DLC**—An attempt is made to derive the significant features of mature hurricane eye in terms of a simplified model of the physical processes undergone by t air composing it. In particular, a quantitative relation is prescribed among the fields of moti temperature, and humidity on the basis of assumptions concerning the exchange of mass a momentum between the eye and its surrounding cloud bands. The basic assumptions are th eye air mixes with the cloud wall on its descent; the latter is maintained by lower level outfl caused by unbalanced centrifugal and Coriolis forces, resulting from the incorporation into t eye of high cloud wall momentum. Joint entrainment and angular momentum calculations for t hypothetical cases of stationary hurricanes of differing intensity show qualitative agreement major features with existing incomplete observations and delineate a computational framework f real cases when available. Modifications of eye structure in moving storms are finally consider *Subject Headings:* **1. Eye of hurricane 2. Hurricane models.**—*Author's abstract.*

12N–319 551.515.

Riehl, Herbert (*Univ. Chicago*), **Comments on the formation of hurricanes.** (In: Tec nical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings,** issu **1958** (?) Section G1 (7 p.) table.) **DWB** (M15.2 A512pr)—Author reviews the known fact involved in the formation of several hurricanes. Whether differences in ventilation rate c explain the differences in development of "Daisy" and other hurricanes mentioned, cannot predicted at this time. *Subject Heading:* **1. Hurricane formation.**—*W.N.*

12N–320 551.515.

Hoover, Eugene W. (*U. S. W. B.*), **Suggested explanations for some irregular movi tropical cyclones.** (In: Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19– 1958, **Proceedings,** issued **1958** (?) Section H3 (12 p.) 15 figs., 3 refs.) **DWB** (M1 A512pr)—The rapidity with which some hurricanes cross the flow toward lower pressure may explained by height changes which are a part of the wave pattern in the westerlies, and as su usually move in the belt of the westerlies. The height changes discussed here refer to the 5 mb, 24-hr height changes. *Subject Headings:* **1. Hurricane movement 2. Hurricane tra pressure field relationships.**—*W.N.*

12N–321 551.515.2/3

Chicago. Univ. Dept. of Meteorology, **Final Report on Contract Cwb-9530, 1958/1959.** onsists of Technical Reports, No. 1, Nov. 1958–No. 10, June 1959). Contents: Technical ort No. 1, Fujita, Tetsuya, **Tornado cyclone: parent system of tornadoes,** Nov. 1958. 5 figs., 5 refs.; No. 2, Fujita, Tetsuya, **Mesoanalysis of hurricane rainbands.** Nov. 1958. 6 figs. (For abstract from another source, *see* 11 H-47, Aug. 1960, *Met. Abs.*); No. 3, ita, Tetsuya, **Structure of convective storms.** May 1959. 5 p. 7 figs. (For abstract, *see* 5–522, June 1962, *Met. Abs.*); No. 4, Fujita, Tetsuya, **Computation method of the velocity individual echoes inside hurricanes.** May 1959. 7 p. 7 figs.; No. 5, Fujita, Tetsuya, tailed analysis of the Fargo tornadoes of June 20, 1957, June 1959. 29 p. 77 figs. (incl. tos), tables, eqs. (For abstract, *see* 12.6–31, June 1961, *Met. Abs.*); No. 6, Fujita, Tetsuya, liminary report on the development of the animated motion picture in mesometeorology. e 1959. 8 p. 31 figs. (incl. photos), table, 7 eqs.; No. 7, Omoto, Yukio and Fujita, Tetsuya, imation of a 700 mb level wind field. June 1959. 6 p. 17 figs.; No. 8, Brown, Henry A., ort on radar thin bands. June 1959. 8 p. 16 figs., 8 refs. Also issued in: *Weather dar Conference, 8th, San Francisco, April 1960, Proceedings,* issued 1960? p. 65–72. 16 figs., efs. **DWB** (M01.81 R124pr); No. 9, Omoto, Yukio, **Study of mesolows on April 25–26,** 7. June 1959. 12 p. 18 figs., 17 refs.; No. 10, Brown, Henry A., **Report on the squall e of June 23, 1957.** June 1959. 9 p. 12 figs., 10 refs. **DWB** (M(051) C532fi)—In Tech- al Report No. 1, cases of tornadoes are reported by Fujita to show the many similarities ween them and characteristics of tornadoes reported by other researchers. Fujita utilized sting station data to study mesometeorological characteristics of hurricanes in Report No. 2. e rainband of Hurricane "Diane," Aug. 17, 1955, was analyzed to determine whether it was anding or shrinking. It was discovered that one portion of the rainband was expanding while other was shrinking. No physical explanation of these motions was found. The features of Fargo tornadoes and the meteorological situations producing them are studied by Fujita in ort No. 3. Included in the report are the results of the computed cyclostrophic wind speed he funnel of the Fargo tornado. A proposed mechanism of an irreversible process taking place de the inflowing air toward the tornado funnel is also presented. Fujita in Report No. 4 ained instantaneous velocities of individual echoes inside Hurricane "Carrie" by using the lified shifting technique. This made it possible to visualize the instantaneous movement of convective cells circling around the storm center. A photographic method was developed which the modified shifting can be made photographically by using a gadget designed for the tiple exposure of echoes on 35 mm negatives. The 5 tornadoes which hit the Fargo-Moorhead a of North Dakota were studied in detail by Fujita in Report No. 5. Important results ling to future theoretical studies of tornadoes and their related systems were obtained. Report 6, by Fujita, includes a description of the animation instrument and techniques being de- oped by Fujita, to describe the behavior of the atmosphere in 2- or preferably 3-dimensional esentations. Omoto and Fujita describe the procedures and problems in making an animated ion picture of a 700 mb wind field in Report No. 7. They suggest means by which the culties encountered in this trial can be avoided in future attempts. Brown, in Report No. 8, lies radar (AN/CPS-9) observations on 4 consecutive days, Aug. 4–7, 1958. These observa- s revealed echoes which have been termed "thin lines"; close examination of radar photographs cated that these lines originated at or near thunderstorm echoes. After formation, the lines ceeded to expand radially and to move away from the thunderstorms. The thin lines had imes considerably longer than the echoes which appeared to generate them, and extended zontally to 50–75 mi and vertically to 5000–10,000 ft. An examination of existing weather rds at the times of thin line passage revealed no precipitation; however, the lines were accom- ied by a temperature drop, an absolute humidity rise, a change in wind direction, and a wind d increase. In Report No. 9, Omoto states that an analysis of the mesolows revealed char- ristics which made it reasonable to consider the existence of mesolows of types other than the nado cyclones" and "wake lows," which had been defined so far. Brown analyzes the squall that developed and moved over the Tex.-Okla. Severe Local Storms Network on June 23, 7, in Report No. 10. Originally a post-cold frontal system, the squall line grew rapidly in and intensity and extended beyond the cold front into the warm sector. In addition to the eorological phenomena that normally accompany a squall line, another feature, the "humidity was noted. The "dip" which previously had been considered to be microscale, proved to have dimensions of a mesoscale phenomenon. *Subject Headings:* **1. Tornadoes 2. Hurricanes Mesometeorology.**—*Based on authors' abstracts.*

12N–322 551.515.2

Christiani, Erwin, **Der Chubasco.** [The Chubasco.] *Wetterlotse,* Hamburg, No. 139/140: 275, Dec. 1958. fig. **DWB**—The description of a local hurricane of Central America's

west coast is described as experienced, along with comments of the editor on the name "Chubasco" *Subject Headings:* **1. Hurricanes 2. Central America 3. "Chubasco."**—*O.T.*

12N–323 551.515

Cry, George W. (*Marine Climatology, U. S. W. B.*), **Naming hurricanes and typhoons** *Mariners Weather Log,* Wash., D. C., 2(4):109, July **1958. DWB, DLC**—Here are the bri facts on the naming of hurricanes. The practice started several hundred years ago, in the We Indies where especially severe storms were named for the Saint's day on which the storm w destructive in the area. GEORGE R. STEWART in his novel **Storm** (1941) named the storm "Maria Girls' names became popular with the Air Force and Navy meteorologists in the Pacific duri World War II. Beginning in 1951, storms were identified in the Atlantic area by names from t international phonetic alphabet, but the practice was changed in 1953 when girls' names in alph betical order were selected in advance for use within the year. The panel selecting the gir names for each year is made up from U. S. Weather Bureau personnel, U. S. Air Force and U. Navy meteorologists. A girl's name is easy to remember and eliminates all confusion as to t identification of a particular storm. The Pacific selection differs from that of the Atlantic a both of the selections for 1958 are included. *Subject Headings:* **1. Hurricane names 2. T phoon names.**—*W.N.*

12N–324 551.515

Davis, Walter R. (*U. S. W. B., Miami, Fla.*), **The 1957 hurricane season.** *Weatherwi* Boston, 11(1):17–19, 36–37, Feb. **1958.** 2 refs. **DWB**—Light hurricane season in 1957 co pared with past 15–20 yrs. "Audrey" (June 25–27), "Bertha" (Aug. 6–11), "Carrie" (Se 6–21), "Debbie" (Sept. 5–7), "Esther" (Sept. 12–19), and "Frieda" (Sept. 20–26) are describ and paths shown on chart. "Carrie" was charted over the longest track on record (6000 mi) fr origin near African Coast to Bermuda and across Atlantic to Ireland. *Subject Headings:* **1. Hu ricanes, 1957 2. Caribbean Region 3. North Atlantic.**—*M.R.*

12N–325 551.515.2:551.461.2(7

Dunn, Gordon E. (*U. S. W. B., Miami, Fla.*), **Hurricanes and hurricane tides.** (In: *Co ference on Coastal Engineering, 6th, Univ. of Florida, Dec. 1957, Proceedings,* pub. **1958.** p. 1 29. 7 figs., 5 refs.) **DWB** (627 C748pr)—Most of the maximum tides of record between Ca Hatteras, N. C., and Brownsville, Tex., have been produced by hurricanes. Some of the high tides of record northward along the coast from Cape Hatteras to Cape Cod have also been produc by hurricanes. The Atlantic hurricane is identical with the Pacific typhoon and the tropi cyclone of the Indian and South Pacific oceans. The term "hurricane" is defined as a storm tropical origin with a cyclonic wind circulation (counterclockwise in the Northern Hemisphe with winds of 75 mph or more. Hurricanes are discussed from the point of view of formati frequency, areas of development, susceptible coastal areas, life span, damage and fatalities, wi field, and energy considerations. In nature, the quantitative contribution of the numerous fact determining the total storm tide has proven impossible to evaluate separately up to this ti *Subject Headings:* **1. Hurricane tides 2. Hurricanes.**—*M.F.H.*

12N–326 551.515.2:06

Gentry, Robert C. (*U. S. W. B., West Palm Beach, Fla.*), **National Hurricane Resea Project 1957 season.** *Mariners Weather Log,* Wash., D. C., 2(5):145–148, Sept. **1958.** 2 f **DWB**—On the basis of data collected by the research flights of the 1957 season, the follow tentative conclusions of practical significance for forecasting of hurricanes, have been reach 1) Hurricanes move in the direction and with the speed of the mean winds inside the str circulation of the storm. 2) Winds measured at flight level by aircraft can be used to descr the low level wind field. 3) Air circulations around the hurricane in the middle troposph interact with the circulation of the storm in such a manner as to put a damper on the intensity the hurricane. 4) Interactions between circulations at high and low elevations in the atmosph determine whether a disturbance can develop into a hurricane. *Subject Headings:* **1. Natio Hurricane Research Project 2. Hurricane forecasting.**—*W.N.*

12N–327 551.51

Gilman, Charles S. and Myers, Vance A. (*both, Hydrometeorological Section, U. S. W. Wash., D. C.*), **Winds and pressures in hurricanes.** *Conference on Coastal Engineering, Univ. of Florida, Dec. 1957, Proceedings,* pub. **1958.** 12 figs., 17 refs. **DWB** (627 C748 **DLC** (TC 203.C6)—The immediate driving force of hurricane winds is the horizontal press gradient directed toward the low pressure always present at the center of the storm. The ultim source of energy in the tropics is the potential density differences between air near the surf

ntinually warmed and moistened from below, and at higher levels. Horizontal density gradients e a supplementary source of energy for storms moving into middle latitudes. The mere presence these energy sources is not sufficient to initiate a hurricane. There are other necessary condi-ns not discussed in this paper. Rainfall is an inherent and necessary part of hurricanes. Some pical rainfall patterns are shown. *Subject Headings:* **1. Hurricane winds 2. Kinetic energy lease in hurricanes 3. Hurricane rainfall patterns.**—*From authors' abstract.*

12N–328 551.515.2:551.461.2

Harris, D. Lee (*U. S. W. B., Wash., D. C.*), **The hurricane surge.** *Conference on Coastal ngineering, 6th, Univ. of Florida, Dec. 1957, Proceedings,* pub. **1958.** p. 96–114. 9 figs., 22 fs., 2 eqs. **DWB** (627 C748pr)—The landfall of a hurricane is generally accompanied by an crease in the tide level by 4–15 ft above the normal value for the time and place at which the orm crosses the shoreline. This difference between the observed tide and that predicted from tronomical considerations is called the storm surge. The best guide to the probable behavior future hurricane surges is believed to be the study of the effects of past hurricanes on sea level. he maximum height of the storm surge along the open coast is clearly a function of the storm ensity, but this factor alone is not sufficient to explain more than half of the observed variance the reported peak storm tides. Topographic effects, such as the funneling of water in con-rging bays can alter the amplitude of the surge by a factor of two, in a distance of only a few les. This fact, together with the tendency of severe hurricanes to destroy the tide gages near eir centers, and the difficulty of eliminating the effects of surface wind waves in interpreting gh water marks, make it difficult to determine exactly the nature of past storm surges. *Subject eading:* **1. Hurricane surges.**—*From author's abstract.*

12N–329 551.515.22(265)

Hilder, Brett, **Report on an intense hurricane.** *Australian Meteorological Magazine,* Mel-urne, No. 25:81–85, June **1959.** fig. **DWB**—A detailed description of a storm at sea. The p's barometer dropped to 28.026 in. (corrected). Wind force was estimated between 100 and 0 knots. A chart shows the path of the "hurricane" and the track of the ship. *Subject Head-gs:* **1. Storms at sea 2. Unnamed hurricanes 3. Hurricane winds.**—*E.Z.S.*

12N–330 551.501.81:551.515.2:551.507.352

Hilleary, Don T. (*Nat'l. Hurricane Proj. U. S. W. B., West Palm Beach, Fla.*), **The Na-nal Hurricane Research Project aircraft instrumentation.** (In: Technical Conference on rricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings,** issued **1958** (?) Section F6 8 p.) 9 figs. **DWB**—(M15.2 A512pr)—The instrumentation for aircraft used in the Project s selected by a special advisory panel on instrumentation. The key consideration behind the sign of the instrumentation system was the minimization of data reduction time, and manpower. tails of this instrumentation are given. *Subject Headings:* **1. National Hurricane Research oject 2. Aircraft weather reconnaissance systems.**—*W.N.*

12N–331 551.515.2:551.511.2

Hubert, Lester F. (*U. S. W. B., Wash., D. C.*), **Distribution of surface friction in hurri-nes.** *Journal of Meteorology,* Boston, 16(4):393–404, Aug. **1959.** 11 figs., 2 tables, 5 refs., eqs. **DWB, DLC.** Also issued as: *U. S. Weather Bureau, National Hurricane Research Proj-, Report,* No. 25, Nov. **1958.** 20 p. 11 figs., 2 tables, 5 refs., 8 eqs. **DWB** (M15.2U5845r) so issued in: Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Pro-edings,** issued **1958**(?) Section G2 (5 p.) 4 figs., 3 eqs. **DWB** (M15.2 A512pr) **[Com-nts** by] Heinz Lettau, and **[Reply** by] Hubert in *Journal of Meteorology,* 17(3):378–379, June 50. fig., eqs. **DWB, DLC**—Terms of the horizontal equations of motion are evaluated from face analysis of three hurricane and three nonhurricane cases in order to investigate the mponents of friction (tangential to and normal to the anemometer wind direction) in the ndary layer. A method of moisture flux analysis is developed to study the variation of the ght of the inflow layer which in turn yields a clue concerning the variation of stress profile time and space. While the magnitude of friction increases toward the hurricane center it is ar that it is not a simple function of wind speed or surface roughness. It is also shown that: The component of friction normal to the surface wind direction is almost always significant. Accelerations are quite small and are not correlated with the downstream pressure force. 3) celerations and angle of cross-isobar flow are correlated. 4) Total friction is not correlated h angle of cross-isobar flow. It is suggested that a compensating mechanism characterizes the ndary layer which changes the angle of cross-isobar flow (thus changing the downstream pres-e force) to compensate a tendency toward acceleration brought about by changes of momentum t from upper layers as well as changes of surface stress. This compensation, in turn, provides

a variable component of friction normal to the surface wind which is almost always significan *Subject Headings:* **1. Hurricane surface friction 2. Frictional layers.**—*Author's abstract.*

12N–332 551.515.2:551.507.35

*Hurt, David A. (*U. S. Navy*), **Weather reconnaissance capabilities of the WV type ai craft.** (In: Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceed ings,** issued **1958** (?) Section F3 (13 p.) 7 refs. **DWB** (M15.2 A512pr)—The Super Co stellations WV-2 and WV-3 are excellent and versatile weather aircraft operating from 500–20,00 ft. The discussion on instrumentation is detailed and includes a description of the latest and be of small and complex instruments. Some applications to hurricane and typhoon probings a discussed and statistics of reconnaissance participation during the hurricane season 1958 a presented. *Subject Headings:* **1. Aircraft weather reconnaissance 2. Hurricane reconnai sance.**—*W.N.*

12N–333 551.21:532.596:551.515.2(02

Leet, Lewis Don, **Natuurrampen en hun oorzaken.** [Causes of catastrophe.] Bew. doo J. Visscher. s-Gravenhage, H. P. Leopold **[1958]** 267 p. Numerous figs., plates.—Transl. the author's **Causes of catastrophe.** (For abstract, *see* 7–45, July 1950, *MAB.*) *Subject Hea ings:* **1. Hurricanes 2. Tidal waves 3. Popular works 4. New England. I. Visscher, J.** (*ed*

12N–334 551.515.2:551.311:551.46

Morgan, James P.; Nichols, Lewis G. and Wright, Martin, **Morphological effects of Hurr cane Audrey on the Louisiana coast.** Louisiana. State Univ. Coastal Studies Inst., Batc Rouge, La., Contract N7 onr 35608, Technical Report No. 10, June 1, **1958.** 53 p. 16 figs 2 tables, 24 refs. **DWB** (M(051)L888te)—Coastal morphological changes resulting from hurr cane "Audrey" which struck the coast of southwestern Louisiana in June 1957, were influence by the coastal characteristics and offshore hydrography of the region. Storm "tides" of hurrica "Audrey" overwhelmed the beaches and resulted in reworking and spreading of their sediment As an immediate aftermath of the storm a zone of exhumed marsh was left between the Mea Gulf Level shoreline and the beach sediments. In the western part of the storm affected regio where the shell-sand beach ridge is more massive, inundation was less extreme, and hurrica effects were quite similar to those observed in association with Atlantic coast hurricanes. Th hurricane did little damage to the shore in the eastern part of the "Audrey" affected area. Hov ever, in this section two large arcuate-shaped masses of fine grained, colloidal clay were carri over the beach and deposited as units. These "mud arcs" have dehydrated since deposition a have become permanent additions to the shoreline stratigraphy. The most significant chang resulting from hurricane "Audrey" are directly derived from disturbance of the beach profi through destruction and spreading of beach deposits. Specific measurements reveal that the mo significant geomorphic change, shoreline retreat, is active during this post-hurricane period a conditions resembling equilibrium of pre-storm beach and offshore profiles have not been esta lished within a year. *Subject Headings:* **1. Hurricane "Audrey" (1957) 2. Hurricane dama 3. Coastal morphology 4. Shoreline changes.**—*From authors' abstract.*

12N–335 550.342:551.515

Newman, B. W. (*Bureau of Met., Brisbane*), and Upton, P. S. (*Geology Dep., Univ. Queensland*), **Microseisms associated with cyclones over northeast Australian waters.** *Au tralian Meteorological Magazine,* Melbourne, No. 22:24–35, Sept. **1958.** 6 figs., 3 refs. **DWB** An examination has been made of microseisms at Brisbane in relation to four major cyclon during 1955, 1956 and 1957, supplemented by data from Townsville in 1957. Theory demand that amplitude should vary with the inverse square root of the distance. From the data co sidered, this requirement is not confirmed but it is likely that the apparent failure may be d to the uncertainty of actual pressure intensity and precise location of the cyclones. A fair rel tionship is obtained between amplitude of microseisms (A), distance (D) and central pressu (P) of the cyclone in the form: Log $AD^n = C - KP$, where n, C and K are constants. It shown that amplitudes may be affected by the depth of the ocean over which the cyclone is movi Limited data were available for comparing the ratios of amplitudes from the two stations, Town ville and Brisbane, especially as development in intensity of the Feb. 1957 cyclone occurred duri the period when it was over shallow water. As a criterion of shallow and deep water the 1,00 fathom depth contour was used. There is also a suggestion that the Townsville amplitudes a relatively high. The four cyclones did not give sufficient data to separate the conditions of cyclo development from progress of the mature storm. *Subject Heading:* **1. Microseism-cyclone rel tionships.**—*Authors' abstract.*

12N–336 551.515.2:551.466.31

Pagney, P., **Mouvements marins d'origine cyclonique. Leurs manifestations dans la** **er Caraïbe spécialement sur les côtes de la Martinique.** [Sea movements of cyclonic origin: **eir manifestations in the Caribbean Sea, especially along the coasts of Martinique.]** *Association* *géographes français, Paris, Bulletin,* No. 276/277:61–72, June/July **1958.** 4 figs., 14 refs.— **a movements caused by hurricanes are hurricane tides and hurricane waves. The author** **dicates the formation, genesis and evolution of both these phenomena in the case of a full** **own hurricane. A circumstantial examination is made of hurricane tides and waves in the** **aribbean Sea, connected with hurricane "Janet" which occurred in Sept. 1955. A study of the** **orphological changes of the Caribbean coast of Martinique due to the hurricane, is also included.** *bject Headings:* **1. Hurricane tides 2. Hurricane waves 3. Hurricane swells.**—*A.V.*

12N–337 551.515.2

Rodewald, Martin, **Zwei deutsche schiffe im Hurrikan Carrie (Sept. 1957).** [Two German **ips in Hurricane "Carrie" (Sept. 1957).]** *Der Wetterlotse,* Hamburg, No. 127:25–38, Feb. **58.** 4 figs. **DWB**—Contains the reports of the captains of M/S "Brandenstein" and of M/S **nita" which encountered hurricane "Carrie." This hurricane caused the destruction of the** **ip "Pamir," last seen by M/S "Brandenstein" on Sept. 19. The "Pamir," on her northerly** **urse carried the staysail only. M/S "Anita" successfully crossed the path of "Carrie" and** **perienced a wind force of 13–14. Wind and pressure data are shown by day and position.** *bject Heading:* **1. Hurricane "Carrie" (1957).**—*W N.*

12N–338 551.515.2:629.12

Rodewald, Martin, **Begegnung mit Ella und Helene.** [Encounter with hurricanes "Ella" **d "Helene."]** *Wetterlotse,* Hamburg, No. 139/140:265–273, Dec. **1958.** 5 figs. **DWB**— **arts show how the fortunate course of some ships, crossing the paths of "Ella" and "Helene,"** **abled them to escape the worst phases of the hurricanes. Other ships, less fortunate, experi-** **ced difficulties because of the hurricanes.** *Subject Headings:* **1. Hurricane "Ella" (1958) Hurricane "Helene" (1958).**—*O.T.*

12N–339 551.515.2:656.61(729)

Römer, Ernst, **Westindische Orkane und hölzerne Segelschiffe.** [West Indian hurricanes **d wooden sailboats.]** *Der Seewart,* Hamburg, 19(2):49–52, April **1958.** fig., ref. **DWB**— **eneral description of a voyage by sailboat through a hurricane off the east coast of the U. S. in** **pt. 1908. This is the only case known to the author in which one of several German wooden** **ips which made the trip from New Orleans to Bremen regularly between the beginning of the** **ntury and World War I (invariably during the hurricane season) was involved in a hurricane.** *bject Headings:* **1. West Indian hurricanes 2. Navigation in hurricanes 3. West Indies.** *G.T.*

12N–340 551.515.2

Simpson, R. H. (*U. S. W. B.*) and Riehl, Herbert (*Univ. of Chicago*), **Mid-tropospheric** **ntilation as a constraint on hurricane development and maintenance.** (In: Technical Con- **rence on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, Proceedings,** issued **1958(?)** **ction D4 (10 p.) 8 figs.) DWB** (M15.2 A512pr)—The main point of this paper is to demon- **rate that independent evidence exists, confirming that lateral advection of midtropospheric air** **om the outside toward the interior of a storm does occur. Data from hurricanes "Carrie"** **957) and "Daisy" (1958) are submitted as evidence of this theory.** *Subject Headings:* **1. Hur-** **ane development theories 2. Hurricane structure.**—*W.N.*

12N–341 551.515.2(261)

Sumner, Howard C. (*Office of Climatology, U. S. W. B.*), **North Atlantic tropical storms,** **56.** *Mariners Weather Log,* Wash., D. C. 1(1):5–7, Jan. **1957.** fig. Also: **North Atlantic** **pical storms, 1957.** *Ibid.,* 2(1):7–11, Jan. **1958.** fig. Also: **North Atlantic tropical storms,** **58.** *Ibid.,* 3(1):5–11, Jan. **1959.** 2 figs. Also: **North Atlantic tropical cyclones, 1959.** *d.;* 4(1):2–7, Jan. **1960.** 2 figs. **DWB**—Development and progress of tropical storms over North Atlantic, Caribbean Sea and the Gulf of Mexico during each year. Charts show paths. *bject Headings:* **1. Tropical storms 2. Annual hurricane reports 3. North Atlantic.**—*M.R.*

12N–342 551.515.2:551.509.312

U. S. Weather Bureau. National Hurricane Research Project, **Bimonthly progress reports.** test issue seen: No. 33, Nov. 15, **1961.** About 10 p. each. charts, refs. Mimeo. **DWB** [15.2 U5845b)—The activities of the various centers, services and contractors in hurricane and

storm surge research, climatological or statistical studies and reports, etc. are outlined in a form similar to that used in previous progress reports. (For Reports, No. 1–8, *see* 8.9–46, Sept. 1957 *Met. Abs.*). *Subject Headings:* **1. National Hurricane Research Project 2. Hurricane research.**—*M.R.*

12N–343 551.515.2

Palmén, Erik (*Academy of Finland*), **Energy problems of the tropical hurricane.** (In Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings,** issued **1958** (?) Section D1 (12 p.) fig., 8 refs., 5 eqs.) **DWB** (M15.2 A512pr)—The aspects treated are: principal energy source, production of kinetic energy, frictional dissipation, sources of energy and temperature distribution, stage of decay, total energy balance and large scale eddy effects. *Subject Heading:* **1. Hurricane dynamics.**—*W.N.*

12N–344 551.515.5

Koteswaram, P. and George, C. A. (*both, Met. Office, Calcutta Airport,* India), **The formation and structure of tropical cyclones in the Indian Sea areas.** *Meteorological Society of Japan, Tokyo, 75th Anniversary Vol. of the Journal,* pub. Nov. **1957.** p. 309–322. 10 figs., 2 refs. **DWB, DLC**—The conditions in the upper troposphere leading to the formation of several tropical cyclones in the Bay of Bengal have been examined. It is noticed that the westward movement of anticyclonic vortices over pre-existing sea level troughs is favorable for the formation of these cyclones. The formation, structure and dissipation of two cyclones in the Bay are discussed. The initial intensification of the sea level trough took place with the bypassing of the upper anticyclonic vortex, while the rapid "winding up" of the cyclone occurred with an inphase superposition of troughs in the easterlies and westerlies, as suggested by RIEHL. The trough in the broad westerlies interlocked with the cyclonic trough in the easterlies south of the subtropical ridgeline in the case of the postmonsoon cyclone; a trough in the broad easterlies became interlocked with a cyclonic trough in the westerlies north of the subtropical ridgeline in the case of the premonsoon cyclone. The disturbances start with cold air in the center and develop a warm core during the stage of their intensification. Their dissipation occurs with the inflow of cold air from neighboring jet streams or wave troughs in the high troposphere. In all these respects the Indian cyclones bear a close similarity to the typhoons of the Pacific and hurricanes of the Atlantic ocean. *Subject Headings:* **1. Tropical cyclone formation 2. Tropical cyclone structure 3. Bay of Bengal.**—*Author's abstract.*

Typhoons

12N–345 551.515.2:551.590.22(52

Ishimaru, Y., **The relation between moon and Baiu or typhooon.** *Journal of Meteorological Research,* 3(9):309, July **1951.** fig. In Japanese. **DWB**—Brief note accompanying elaborate graph showing relation between phase of moon, typhoon frequency and temperature on Kyushu. *Subject Headings:* **1. Lunar influences on typhoon frequency 2. Typhoon frequency 3. Baiu 4. Kyushu, Japan.**—*M.R.*

12N–346 551.515.2

Minegishi, S., **On the structure of the Typhoon Ruth by means of contour-height anomaly analysis.** *Journal of Meteorological Research,* Tokyo, 5(7):558–573, Aug. **1953.** 17 figs., 6 refs. In Japanese; English summary p. 558.—Contour height anomalies and vertical distribution of wind speed and mean virtual temperature are analyzed in connection with a typhoon over Japan (Oct. 1951). Changes in height of the typhoon, its axial inclination and other properties during its passage over land are described. *Subject Headings:* **1. Typhoon structure 2. Typhoon "Ruth" (1951) 3. Japan.**—*G.T.*

12N–347 551.515.2:551.577.37(52

Fukuoka District, Japan. Meteorological Observatory, **Distribution of rainfall caused by typhoon in Kyushu.** Its *Memoirs,* No. 12, March **1955.** 117 p. Mostly tables and charts. In Japanese; English summary p. 117. **DWB** (M15.2 F961d)—Detailed and extensive data are presented on all typhoons passing over or near Kyushu, which gave > 150 mm rainfall. Four typhoons passing over Kyushu but giving < 150 mm rain were excluded. Path of typhoon, rainfall distribution in Kyushu, minimum pressure, maximum wind speed, time of onset, and ending of strong winds, maximum rainfall in one hr, time of occurrence of rains at stations in Kyushu plus total and daily rainfall at all stations in the network, a station location chart and list, and many isohyetal charts are included. *Subject Headings:* **1. Typhoon rainfall distribution 2. Typhoon data 3. Kyushu, Japan.**—*M.R.*

12N–348 551.515.2:656.61

Rodewald, M., **Zum Taifun Anita.** [On typhoon "Anita."] *Wetterlotse*, No. 90:145–150, ly 1955. 2 figs. **DLC**—The warning issued in English by the Japanese Central Weather Office reproduced with German translation, and discussed. It explains the procedure to be adopted a ship's captain when the planned course intercepts the forecast typhoon track. *Subject Head-gs:* **1. Navigation in typhoons 2. Typhoon "Anita," 1955.**—*C.E.P.S.*

12N–349 551.515.23(529)

Wang, S. T., **A preliminary study of the trends and the movements of typhoons in the est Pacific.** *Meteorological Bulletin*, Taipei, Formosa, 1(2):27–34, June **1955.** 15 figs., ref. Chinese. **DLC** (Orientalia)—An analysis of 22 typhoons which passed by or through Taiwan, 52–54, in order to classify them according to latitude, longitude, and variation of movement. was found that without exception the typhoons originated in the Caroline Islands, moved through e Philippines and the South Sea, and proceeded to Taiwan. *Subject Headings:* **1. Typhoon ovement 2. Formosa.**—*K.C.*

12N–350 551.515.22

Chakravortty, K. C. (*Met. Dept., India*), **Calm centers of storms originating in the Bay of ngal.** (In: Tropical Cyclone Symposium, Brisbane, Dec. 1956, **Proceedings.** Pub. Dec. **1956.** 171–175. 12 refs.) **DWB**—Examples of Bay of Bengal cyclones with calm centers. The ameter of the eye, wind conditions in the eye, and temperature, humidity, cloudiness and pre-itation in the eye are discussed. *Subject Headings:* **1. Eye of typhoon 2. Bay of Bengal.**—*R.*

12N–351 551.515.2:551.556.1

[Formosa. Weather Forecasting and Research Center], **Reports on Typhoons "Wanda" d "Dinah."** *Meteorological Bulletin*, Taipei, Formosa, 2(3):46–61, Sept. **1956.** numerous figs. Chinese. **DLC** (Orientalia)—"Wanda," which started near the Mariana Islands on July 26, 56 and gradually moved towards Guam in the midst of descending air pressure, reached Iwojima d traveled through the Ryukyu Islands in a northwesterly direction. The typhoon reached Taipei July 31, and finally disappeared on Aug. 3, plunging into the China sea. One of the unusual pects of "Wanda" was the large deviation in the direction of its course. At the end of Aug. 56, a tropical storm formed N of the Philippines and W of the Marianas, developing into Dinah" with maximum wind speed at 70 knots/hr and falling pressure at 999 mb. "Dinah" ved gradually westward, and suddenly on Sept. 2, the typhoon split, one section moving N d the other NNW, reaching a maximum wind speed of 90 knots/hr. Climatic conditions, de-opment and progress of both typhoons are discussed. *Subject Headings:* **1. Typhoon "Wanda" 956) 2. Typhoon "Dinah" (1956).**—*K.C.*

12N–352 551.515.21/23

†Hatakeyama, H. (*Met. Res. Inst., Tokyo, Japan*), **Recent researches on typhoons in Japan.** *cific Science Congress, 8th, Quezon City, Philippines, Nov 1953. Proceedings*, Vol. IIA, pub. 56. p. 1006–1024. 5 figs., 61 refs. **DWB**—In the summer of 1951 the Central Meteorological servatory started the Typhoon Research Project. The author summarizes the results of recent earch on the structure and movement of typhoons, including both observational and theoretical dies. *Subject Headings:* **1. Typhoon Research Project 2. Typhoon movement 3. Typhoon ucture.**—*I.L.D.*

12N–353 551.515.2:551.556.8:551.461.2

Ichiye, Takashi (*Japan Met. Agency*), **On the secondary undulations caused by the Ty-oon "5415," Pt. 1, General relationships between winds and amplitudes (Researches on the orm Surg, IIa).** *Oceanographical Magazine*, Tokyo, 8(2):97–106, Dec. **1956.** 5 figs., 2 les, 5 refs., 7 eqs. **DWB, DLC**—Typhoon "Marie" caused conspicuous storm surges on the st of Honshu and on the coast of Hokkaido, and at the same time, remarkable secondary undu-ons were observed at several tidal stations. They were very much different in period and plitude at each station and also, they did not correspond to the conditions of the storm surge. at is, at some stations they had a large amplitude notwithstanding the slight storm surge there, at other stations the conspicuous deviations of tide from the predicted one were not accom-ied by these undulations. Further, their occurrence becomes important not only from the ntific point of view, but also from the practical one, in relation to damage caused by the rm surge, since their amplitude reached several meters at some stations. In this paper the ondary undulations appearing in the mareograms are studied, in relation to the meteorological ditions, and some dynamic treatments of their occurrence are given. (For abstract of Pt. 2,

see 12M-555, Suppl. No. 2, 1961, *Met. Abs.*) *Subject Headings:* **1. Secondary undulation 2. Typhoon "Marie" (1954).**—*Author's introduction.*

12N-354 551.515.2

Masui, T. (*Yokohama National Univ., Kanagawa-ken, Japan*), **Upper layer structure o typhoon.** *Geofisica Pura a Applicata,* Milan, 33:262–266, **1956.** 3 figs., tables, 4 refs. **DLC**— The results of studies of upper air circulation of tropical storms are summarized, and trends o the 1954 typhoons that passed over Japan are discussed. A detailed analysis is given of th behavior of typhoon No. 5405 ("Grace") which passed over Japan in Aug. 1954. Data on th measurement of the center and pressure of the surface, and the anticyclonic eddies above the cente and synoptic maps are given. Two anticyclonic eddies were clearly evident at both sides of th cyclonic center. *Subject Headings:* **1. Typhoon structure 2. Upper air circulation of tropica storms 3. Typhoon "Grace" (1954) 4. Japan.**—*I.L.D.*

12N-355 551.515.2(265

Sasaki, R. (*Japan Met. Agency, Tokyo*), **On the development of typhoon Marie over th Sea of Japan in September 1954.** *Geophysical Magazine,* Tokyo, 27(4):515–525, Dec. 195(6 figs., 10 refs., 2 eqs. **DWB, DLC**—The extraordinary process through which typhoon "Marie developed over the sea of Japan so intensely and quickly that the ferryboat "Toya-Maru" an four others were sunk, is analyzed and explained by Sutcliffe's development theory. This wa the greatest disaster of this kind in Japan and occurred on Sept. 26, 1954 at Hakodate harbor o Hokkaido, Japan. The analysis shows that the principal factors in the development were th socalled thermal steering term and the thermal vorticity term. Both factors are shown to hav contributed to the development in phase leading to the extraordinary intensification. *Subje Headings:* **1. Typhoon "Marie" (1954) 2. Typhoon analysis 3. Western Pacific.**—*Author abstract.*

12N-356 551.515.2(265.4

Sekioka, Mitsuru (*Osaka Gakugei Univ., Osaka*), **A hypothesis on complex of tropical an extratropical cyclones for typhoon in middle latitudes, Pt. 1, Synoptic structure of typhoo Marie passing over the Japan sea.** *Meteorological Society of Japan, Tokyo, Journal,* Ser. 34(5):276–287, Oct. **1956.** English summary p. 276. 10 figs., 7 tables, 5 refs. Also: **Pt. Synoptic structure of typhoons Louise, Kezia and Jane passing over the Japan Sea.** *Ibid* Ser. 2, 34(6):336–345, Dec. **1956.** 15 figs., 9 tables, 3 refs. (*see* 12.2–308, Feb. **1961,** *MAB* Also: **Pt. 3, Examples of typhoon not accompanied by extratropical cyclone in the middl latitudes.** *Ibid.,* Ser. 2, 35(3):170–173, June **1957.** 5 figs., 3 tables, 5 refs., 3 eqs. Englis summary p. 20. Also: **Pt. 4, Analyses on typhoons invading into the Japan Sea during th period from 1947 to 1956.** *Ibid.,* Ser. 2, 37(4):111–114, Aug. **1959.** 3 tables, 4 refs. Englis summary p. 111. **DWB, DLC**—Typhoon "Marie" is notable for her unusual behavior of red velopment over the Sea of Japan. An analysis is attempted, based on the supposition that such situation can be explained by superposing an extratropical cyclone on the main typhoon. Th results show that the development of the superposed extratropical cyclone accounts fully for th apparent redevelopment of such a typhoon, the main typhoon being considered to be at the decay ing stage during that period. The above mentioned supposition is confirmed synoptically in th present paper, leading to an important suggestion on the mechanism of redevelopment of th typhoon in the middle latitudes. In Pt. 3, typhoons "Faye" and "Freda" are examined as ex amples of typhoons not accompanied by an extratropical cyclone. It is suggested that either th nonexistence of a front near the Japanese Islands or lack of contact of the main typhoon with th front, prevents the formation of an accompanying extratropical cyclone. In Pt. 4, a statistic confirmation of the author's hypothesis is given. It is shown that all typhoons which entered th Sea of Japan during the period 1947–1956 can be explained without exception by the prese hypothesis. *Subject Headings:* **1. Typhoon redevelopment 2. Typhoon theories 3 Typhoo transformation into extratropical cyclones 4. Synoptic analysis of typhoons 5. Sea o Japan.**—*Author's abstract.*

12N-357 551.515.2

Jordan, Charles L. (*Nat. Hurricane Res. Project, West Palm Beach, Fla.*), **Estimatin central pressure of tropical cyclones from aircraft data.** *U. S. Weather Bureau, Nation Hurricane Research Project, Report,* No. 10, Aug., **1957.** 12 p. 6 figs., table, 10 refs., 7 eq **DWB** (M15.2 U5845r)—Previous (1952) studies of the relation between surface pressures the eye of typhoons in the Pacific and the height of the 700 mb pressure as obtained from dro sonde data have been extended by using more recent data (1953 and 1954), for both the Paci and the Atlantic, and data up to 500 mb level. In all, 245 dropsonde observations were used

iving an empirical formula for preparing a nomogram to use in actual analysis. The histo-ms of deviation of surface pressure from reported 700 mb heights show extent of scatter. A ond regression line is shown for 500 mb heights vs surface pressure in 48 hurricanes (1955–. The structure of the eye is revealed in these data. *Subject Heading:* **1. Eye of typhoon.** *M.R.*

12N–358 551.515.2:551.466.3

Unoki, Sange (*Ocean. Lab., Met. Res. Inst., Tokyo*), **Distribution of waves viewed from ometric consideration and typhoon reconnaissance by aircrafts (On the ocean waves due tropical cyclones, Pt. 2).** *Meteorological Society of Japan, Tokyo, Journal,* Ser. 2, 35(2): -87, April **1957.** 3 figs., 3 tables, 10 refs., 8 eqs. **DWB, DLC**—Distribution diagrams of ell in a tropical cyclone, constructed on the basis of a simple geometric concept, agreed satis-torily with what had been shown by CLINE, TANNEHILL, OOTANI, ARAKAWA and others, and variety of the distribution according to the speed and track of the storm was discussed quan-tively. When the speed of the storm exceeds that of the swell, it is possible to locate the ell with an almost opposite direction from the wind, in the the left rear quadrant of the storm; swell with a direction deviating from the wind, in the left rear quadrant of the storm; and swell with a direction deviating from the wind to the left (contrary to TANNEHILL's concept), the right rear quadrant. Based upon a report on typhoon reconnaissance by aircraft, the varia-n of the state of the sea and swell in relation to the development of the storm was investigated. was also shown that in the case of typhoons associated with a frontal system, the confused sea, the swell with an unusual direction, is likely to be raised in the seas adjacent to the front. e fact that the sea in the eye of the storm is less confused when the storm moves slowly, very fused when it moves with almost the same speed as that of the wave, and somewhat confused en it moves very rapidly, was found and explained theoretically. Moreover, the occurrence a confused sea in a storm in regions other than the eye, is discussed. (For Pt. 1, *see* 11.4–, April 1960, *Met. Abs.;* Pt. 3, *see* 10.5–237, May 1958, *Met. Abs.*) *Subject Headings:* **1. phoon waves 2. Typhoon swell.**—*Author's abstract.*

12N–359 551.515.22:551.54

Uwai, K., **On atmospheric disturbances in low latitudes, Pt. 1, On the pressure pattern ar the equator.** *Journal of Meteorological Research,* Tokyo, 9(5):335–343, July **1957.** 10 ., 8 refs., 20 eqs. In Japanese; English summary p. 335–336. Also: **Pt. 2, On the structure atmospheric disturbance at initial stage in low latitudes.** *Ibid.,* 9(6):407–412, July **1957.** figs., 8 refs. (*See* 10.1–213, Jan. 1959, *Met. Abs.*) Also: **Pt. 3, Generation of pressure ugh and formation of low.** *Ibid.,* 9(7):467–474, July **1957.** 11 figs., ref., 4 eqs. In Japa-e; English summary p. 467. (*See* 10.1–214, Jan. 1959, *Met. Abs.*) Also: **Pt. 4, Periodic iation of 1 to 2 days in typhoon appearing both in the pressure change at the center and the upper air situation over the central region.** *Ibid.,* 9(8):566–569, Aug. **1957.** 3 figs., s., 13 eqs. In Japanese; English summary p. 566. **DWB, DLC**—Pt. 1 is a study of the ssure patterns, air flow and convergence zones in the equatorial belts on both sides of the ator. The variations in flow pattern (e.g., easterly waves, westerly equatorial flow, ITC, ughs, etc.) are illustrated and explained. In Pt. 4, the author discusses the periodic change 1–2 days of air pressure at the center of the typhoon, and the upper air situation, including the ucture of the stream line and the ascent curve in the typhoon eye. *Subject Headings:* **1. Upper flow patterns 2. Pressure patterns 3. Convergence zones 4. Typhoon pressure 5. Eye typhoon 6. Equatorial belt.**—*M.R. and author's abstract.*

12N–360 551.515.2(529)

Wang, S. T., **Some discussions on typhoons of 1956.** *Meteorological Bulletin,* Taipei, rmosa, 3(1):20–24, March **1957.** 9 figs., 4 refs. In Chinese. **DLC** (Orientalia)—The hor has classified typhoons into two kinds: one always penetrates Taiwan, such as "Dinah," reda," and "Gilda," all in Sept. 1956; and the other by-passes the island, such as "Sarah" in ril and "Jean" in Oct. Typhoons generated in Sept. are more dangerous than others. "Jean" l a peculiarity of disappearing and was related to high circulation from Siberia. *Subject adings:* **1. Typhoon classification 2. Taipei, Formosa.**—*K.C.*

12N–361 551.515.2(968.1)

Blumenstock, David I. (*Pacific Area Climatologist, U. S. W. B., Honolulu, Hawaii*), **Typhoon ects at Jaluit Atoll in the Marshall Islands.** *Nature,* London, 182(4645):1267–1269, No. 8, 8. **DWB**—Typhoon "Ophelia" that passed directly over Jaluit Atoll in the Marshall Islands Jan. 7, 1958, was small but very intense. It appeared at Palmyra Island, struck Jaluit, moved a WNW course heading through the Marshall and Caroline Islands and finally entered the lippine Sea where it died out. The geomorphic changes and effects of the storm on soil, vege-

tation, terrestrial fauna, submarine features and marine life are discussed. It is planned to restu Jaluit Atoll at intervals to learn how an atoll recovers from a typhoon strike. *Subject Heading* **1. Typhoons 2. Jaluit Atoll, Marshall Islands.**—*N.N.*

12N–362 551.515

Blumenstock, David I. (*Pacific Area Climatologist, Honolulu*), **Typhoon Ophelia at Jalu Atoll.** *Mariners Weather Log,* Wash., D. C., 2(6):182–183, Nov. **1958.** photo. **DWB**—T devastating wind which struck the islets on Jan. 8, 1958 caused 16 deaths, destruction of abo 80–90% of the vegetation and radical change of the islets' hydrographic features. No dwelling except the Japanese block houses, withstood the intensity of the 50 mi diameter storm moving from the southeast shortly after the heavy swells. *Subject Headings:* **1. Typhoon "Ophelia (1958) 2. Jaluit Atoll.**—*W.N.*

12N–363 551.515

Fortner, Limon E., Jr. (*Andersen Air Force Base, Guam*), **Typhoon Sarah 1956.** *Americ Meteorological Society, Bulletin,* 39(12):633–639, Dec.**1958.** 5 figs., table. **DWB, DLC** Typhoon "Sarah," 1956, the first of the season, was unusual in several respects. First, "Sara formed in a tropical depression that first became a closed circulation less than 100 mi from t equator. Second, "Sarah" showed a marked diurnal variation in intensity after reaching a ma mum of intensity on the second day as a typhoon. Third, besides the diurnal variation the were two periods of intensification and weakening. Fourth, the cyclone retrograded to the E-S several hundred mi parallel to its previous track. The diurnal variation of typhoon "Sara appears to have had its origin in the arrival of short intense lines of convergence at the ey The arrival of these lines of convergence at the eye furnished the energy that gave the typho a pulsating characteristic. *Subject Headings:* **1. Typhoon "Sarah" (1956) 2. Typhoon analys** —*Author's abstract.*

12N–364 551.515.

Report on typhoon "Grace." *Meteorological Bulletin,* Taipei, Formosa, 4(4):33–38, De **1958.** 10 figs., table. In Chinese; English summary p. 33. **DWB, DLC**—Typhoon "Grac first appeared at 350 knots SE of Guam on Aug. 28, 1958. The velocity at its center increas to 110 knots/hr 48 hrs after its inception. On the morning of Sept. 3, it approached about knots to east coast of Taiwan. The center passed at a close distance SW of Penchiuayu a arrived at the coast of Kukien province. Later its movement shifted to the NE instead of NV The life of typhoon "Grace" was about 8 days with its maximum wind velocity of 150 knots/h Typhoon "Grace" had a maximum amount of rainfall of 118.7 mm at Taipei, and incurred death toll of 13. About 756 houses were damaged and 2732 people were rendered homeless duri the passage of this fierce storm. *Subject Headings:* **1. Typhoon "Grace" (1958) 2. Typho data.**—*Author's abstract.*

12N–365 551.515.

Rohlfs, A. J. (*Port Supervisor, Pacific Weather Project, Honolulu*), **Typhoon Del** *Mariners Weather Log,* Wash., D. C., 2(2):38–39, March **1958.** 2 figs. **DWB**—"Della's" orig is somewhat obscure. It is thought that she came into being as a tropical storm during late Au 1957 in an area of few ship reports, to the south and east of the Hawaiian Islands. As s crossed the International Date Line her classification changed from hurricane to typhoon. "Dell was unusual in several respects, including her track, and the lack of severe damage to land mass or merchant shipping. *Subject Headings:* **1. Typhoon "Della" (1957) 2. Typhoon formatio** —*N.N.*

12N–366 551.515.2:466.7(265.

*Seki, S., **On the storm tide in Tokyo Bay caused by the typhoon Alice (No. 5811) July 1958.** *Journal of Meteorological Research,* Tokyo, 10(11):955–959, Nov. **1958.** 4 fig 2 tables, 3 refs., eq. In Japanese. **DWB, DLC**—The forecasting of high tides caused by typhoon in the Bay of Tokyo is made possible by knowing both the falling pressure and the wi direction. With an analysis of typhoon "Alice" (No. 5811) that had passed by Tokyo on Ju 23, 1958, as well as through Shizuoka and Sendai, a comparative study of high tides and seconda vibrations and hourly variations was made in the three bays of Tokyo, Yokohama, and Kawasa and the resultant values are presented in tables. *Subject Headings:* **1. Typhoon "Alice" (195 2. Storm tides 3. Tokyo Bay.**—*K.C.*

12N–367 551.515

Steinborn, E., **Vermeiden des Taifuns AGNES (August 1957) durch die Motorschif "Adolf Vinnen" und "Dammtor."** [Avoidance of typhoon "Agnes" (Aug. 1957) by the shi

lolf Vinnen" and "Dammtor."] *Der Wetterlotse,* Hamburg, No. 126:9–15, Jan.1958. 2 figs. VB—Brief accounts are given including map, weather map and data on the storm which, on g. 17, 1957, had gusts of 370 km/hr and had a wind speed next day of 300 km/hr. The ships uited calmer weather and suffered only minor time loss. *Subject Heading:* **1. Typhoon gnes" (1957).**—*W.N.*

12N–368 551.515.2:551.513(5)

Takenaga, K., **On the development of westerly waves induced by typhoon.** *Journal of teorological Research,* Tokyo, 10(8):666–672, Aug. **1958.** 10 figs., table, 5 refs., 3 eqs. In anese; English summary p. 666. [**Comments** by] T. Asakura, and [**Reply** by] Takenaga. d., 10(12):1062–1063, Dec. **1958.** In Japanese. **DWB, DLC**—Most cutoff highs formed over Far East area in the typhoon season are associated with the northward movement of a typhoon. a few other cases, when no cutoff phenomenon occurs, the path of the typhoon is along a igh line in the westerlies. *Subject Headings:* **1. Typhoon effects on circulation 2. Far st.**—*Author's abstract.*

12N–369 551.515.2:061.3(52)

U. S. Air Force. 1st Weather Wing, **Record of proceedings of the 1st Weather Wing phoon Conference, Fuchu Air Station, Japan. Feb. 4–8, 1958.** 48 p. 3 separately paged exes. Pertinent appended articles include: Kume, Tsunetaka, **Method of locating typhoon ters from surface synoptic reports,** Annex 1: 1–12. Takahashi, K., **Temperature field as index of a typhoon movement,** Annex 1: 13–17. Masuda, Z., **Numerical prediction of the hoon movement by making use of the stream function,** Annex 1: 19–30. Arakawa, H., **usoidal movement of a revolving wind system,** Annex 1: 31–36. Terauchi, Eichi, **On nerical prediction of typhoon tracks in Japan Meteorological Agency,** Annex 1: 37–44. ono, S., **Motion and change of the structure of typhoons,** Annex 1: 45–71. Kinney, John R., comp., **Typhoon forecasting guide,** Annex 2: 1–12. **General analysis of the AWS Typhoon Warning Service in the western North Pacific,** Annex 3: 1–44. **DWB** (M15.2 F527re) er presentation of the formal papers, the Conference broke up into specialized committee meets for discussions and made recommendations on various aspects of the problem. Results of mittee sessions are listed under four heads in Section IV. Annex 1 consists of presentations le at joint meeting with the Japan Meteorological Agency. *Subject Headings:* **1. Typhoon ferences 2. Fuchu Air Station, Japan.**—*I.S.*

12N–370 551.515.2:551.466.327

Unoki, Sanae and Nakano, Masito (*both, Met. Res. Inst., Tokyo*), **Estimation of storm ves caused by typhoons at Gozen-iwa and Goto-nada.** *Oceanographical Society of Japan, rnal,* 14(1):15–23, March **1958.** 10 figs., 3 tables, 11 refs., eqs. **AGU**—On the occasion of phoon No. 9 which attacked Western Japan in Aug. 1956, billows with wave height more than m occurred in a part of Goto-nada, and a great deal of damagae was done in the vicinity. As se billows are said to be a record for several decades for that district, an investigation was le in order to clarify the condition of their generation. Again, as the basic data necessary for construction of a lighthouse at Gozen-iwa, a sunken rock in the open sea off Omaezaki, the timum deep water wave height off Gozen-iwa and the maximum breaker height in the interior Gozen-iwa were estimated. *Subject Headings:* **1. Typhoon waves 2. Ocean wave height a 3. Japan.**—*Authors' abstract.*

12N–371 551.515.23

Imakado, M., **On the relation between the track of typhoon in low latitudes and that in ddle latitudes.** *Journal of Meteorological Research,* Tokyo, 11(8):714–719, Aug. **1959.** 6 figs., e, 5 refs. In Japanese. **DWB, DLC**—In order to investigate the tracks of typhoons that sed through 20° lat., 156 were selected from typhoons occurring 1940–1956. On the basis of r paths, they are divided into 6 types, for each of which the major track and frequency are wn. Seasonal variations, starting and turning points of the track, proximity to mainland areas, characteristics of each type are discussed. It is concluded that typhoons occur at 135°E long. uly, and until the middle of Sept. tend to move in a track close to western Japan. On the r hand, typhoons at the same longitude after the middle of Sept. tend to pass near eastern an. *Subject Headings:* **1. Typhoon tracks 2. Japan.**—*K.C.*

12N–372 551.515.2:551.542

Jordan, Charles L. (*Florida State Univ., Tallahassee, Fla.*), **A reported sea level pressure 77 mb.** *Monthly Weather Review,* Wash., D. C., 87(9):365–366, Sept. **1959.** table, 3 refs. **B, DLC**—The paper claims that typhoon "Ida" of 1958 should be accepted as the deepest

cyclone on record and cites pertinent evidence. On Sept. 24, 1958, a dropsonde observation ma in the eye of typhoon "Ida" showed a sea level pressure of 877 mb (25.91 in.), the lowest s level pressure ever recorded. At the time of this observation, typhoon "Ida" was located ne 18.9°N, 135.3°E, or about 600 mi NW of Guam. The temperature, dewpoint, and pressure heig data reported in this sounding are discussed and tabulated. Two other dropsondes made so time before and after this dropsonde from different aircraft report 878 mb and 886 mb, resp tively, and rule out the possibility of altimetry errors of any importance. *Subject Heading* **1. Record low pressure 2. Sea level pressures 3. Typhoon "Ida" (1958).**—*I.S.*

12N–373 551.515.23:551.583.13(5

Kikuta, I. and Nagata, M., **On the relation between typhoon and change of weather tren** *Journal of Meteorological Research,* Tokyo, 11(2):81–88, Feb. **1959.** 12 figs., 5 tables, 4 re In Japanese; English summary p. 81. **DWB**—The authors examined the relationship betwe typhoons and the weather trend in western Japan, and found that typhoons seem to have a defini though varying effect by season, on the change of weather. The change from summer to autu is accompanied by the change from ridge to trough in the upper air pattern over Japan, which due to a large scale change in the Northern Hemisphere, particularly in the northern Pacific. a typhoon passes near Japan in the period of changing weather, the degree of change of Japane weather may be very remarkable. *Subject Headings:* **1. Typhoon effects on weather 2. Wes ern Japan.**—*Author's abstract.*

12N–374 551.515.23(21

*Namikawa, Yoshitaka, **Motion of the tropical storm. 1959.** Thesis (Ms. of Sci. in Me —U. S. Naval Post-graduate School, Monterey, Calif. 28 p. 16 figs., 8 tables, eqs. **DW** (M15.2 N174mo)—Equations for the motion of a tropical storm are derived by assuming th the wind field consists of the vortex motion superimposed on a basic current. The differenti equations are integrated numerically for a variety of typical pressure fields, namely, a consta pressure gradient representing straight parallel isobars; a high pressure cell, represented by elliptical paraboloid; and a "col," represented by a hyperboloid paraboloid. Examples for typhoo "Clara," Nov. 1950 and "Jean," Oct. 1956 in the Western Pacific are analyzed. *Subject Hea ings:* **1. Tropical storms 2. Typhoon 3. Typhoon "Clara" (1950) 4. Typhoon "Jea (1956) 5. Western Pacific.**—*Author's abstract.*

12N–375 551.515.23:629.

Shimada, K., **Some discussions on the path of Typhoon 5811 Alice determined by t reconnaissance flight data.** *Journal of Meteorological Research,* Tokyo, 11(3):184–189, Mar **1959.** 7 figs., 3 refs. In Japanese; English summary p. 184. **DWB, DLC**—The irregular pa of typhoon 5811, "Alice" is examined by using the data from the typhoon reconnaissance fligh A rare situation is shown, i.e., typhoon "Alice" was separated into two circulations while she w moving over the ocean. *Subject Headings:* **1. Typhoon "Alice" (1958) 2. Typhoon tracks.** *Author's summary.*

12N–376 551.51

§*U. S. Navy. Fleet Weather Central/Joint Typhoon Warning Center, Guam, **Annual typho report.** Latest issue seen: 1961, issued April **1962.**. charts, figs., photos, tables. **DWB** (M1. U585aty)—Summarizes Western North Pacific and Central North Pacific tropical cyclones. Da include number of typhoons, area of formation and development, size and intensity, movement, e Techniques of detection and forecasting are discussed. Destructive effects of the typhoons a analyzed. Each typhoon is briefly described, and charts illustrate their tracks. *Subject Hea ings:* **1. Typhoons, Western North Pacific 2. Typhoons, Central North Pacific 3. Annu typhoon reports 4. Pacific Ocean.**—*M.F.H.*

Tornadoes, Waterspouts, Whirlwinds, Dust Devils (551.515.3)

Tornadoes

12N–377 551.51

U. S. Weather Bureau, **Tornado safety rules. [1952]** 2 p. **DWB**—On the front of t sheet are given 7 rules for safety in tornado areas, and on the back, answers to a dozen questi about tornado behavior. *Subject Headings:* **1. Tornado safety rules 2. Tornado behavior** *M.R.*

12N–378 551.515.3:551.556.1(76

Baden, Ira J., **My 45 seconds inside the tornado.** *Saturday Evening Post,* Phil., 226(2 17–19, 74–76, July 11, **1953.** photos. **DWB**—A vivid personal account of experiences dur

co, Tex. tornado of June 1953, with excellent photographs of damage. *Subject Headings:* Tornado damage 2. Tornado, Waco, Tex. (June 1953).—*M.R.*

12N–379 551.515.3:551.556.1:778.3(744)

Worcester Telegram and The Evening Gazette, Worcester, Mass., **Tornado. A record in ture of the catastrophe that struck Worcester and Central Massachusetts, June 9, 1953.** sue of] June 18, 1953. 40 p. photos.—A remarkable collection of 120 photographs and charts, wing the terrific damage done to homes, factories, schools, trees and automobiles in Worcester, ss. and its several suburbs from 4:30–5:40 p.m., June 9, 1953. A chart shows the course of tornado across Worcester county from NW to SE at a speed of 50 mph. It was stated that forecast was for "clearing with little change in temperature." The storm killed 87 and injured 0 people, destroyed or damaged 4000 homes and caused damage of more than 50 million dollars ne worst disaster in central New England in history. This was one of the few tornadoes ever trike the region. Even the 1938 hurricane damage did not exceed that of the June 9 tornado. *ject Headings:* 1. Tornado damage photographs 2. Tornado, Worcester, Mass. (June 3) 3. Worcester, Mass.—*M.R.*

12N–380 551.515.3(778)

"Tornado warning." *Missouri Farmer,* 46(5):8–9, May 1954. illus., table. **DWB**—A few res on tornado statistics for the past 38 yrs, with particular attention to Missouri, suggestions safest behavior during tornadoes and a brief discussion of Weather Bureau severe storm warn activities are the substance of this article. *Subject Headings:* 1. Tornadoes 2. Tornado istics 3. Missouri.—*G.T.*

12N–381 551.515.33(09)(767)

Asp, M. C. (*Weather Bur. Airport Station, Little Rock, Ark.*), **Some longer tornado paths Arkansas about a century ago.** *Monthly Weather Review,* Wash., D. C. 83(6):117–118, e 1955. fig., 3 refs., foot-note. **DWB, DLC**—Paths of major tornadoes (1829–54) are shown a large map of Ark. Brief history of records kept by the General Land Office, as gathered by ineers preparing the Federal Land Survey, mainly from timber fall indications, is included. In NW corner of the state the paths all move from NW–SE and then some hook toward NE. r the rest of the state the movement is SW–NE. *Subject Headings:* 1. Tornado tracks 2. ber fall due to tornadoes 3. Historical weather records 4. Arkansas.—*M.R.*

12N–382 551.515.31(52)

Shu, Y. T., **A preliminary survey of Sin-Chu tornado of July 18, 1955.** *Metcorological letin,* Taipei, Formosa, 1(3):49–52, Sept. 1955. 3 figs., 3 tables. In Chinese. **DLC** (Orilia)—Weather conditions at noon July 18 were very unstable, with some fog, cumulus clouds he lower layer, altocumulus clouds in the upper layer, with an easterly wind of low velocity. tornado's diameter was 120 ft and its speed 18 mi/hr. In order to learn the cause of the ado, upper air current data recorded at 3 p.m. Sept. 18 (International GMT) near Taipei, e analyzed, including temperature, relative humidity, wind direction and speed at an altitude 4,840 ft. Two conditions appear to be involved in the development of the tornado: 1) inility of overlapping warm and humid air, and 2) an equatorial ocean air mass intensifying moving north. *Subject Headings:* 1. Tornado formation 2. Sin-Chu District, Formosa. .C.

12N–383 551.515.31(492)

Een opmerkelijk verschijnsel bij een hoos. [A remarkable phenomenon accompanying a ado.] *Hemel en Dampkring,* The Hague, 54(5): 104, May 1956. 4 figs. **DWB, DLC**—author presents sketches of the development of a tornado at Terschelling on Aug. 9, 1955. *ject Headings:* 1. Tornado formation 2. Terschelling, Netherlands.—*I.L.D.*

12N–384 551.509.52 551.515.3(74)

Boucher, Roland J., **Synoptic and meso scale aspects of severe local storms in New Eng: appendix [of] 50 synoptic situations accompanied by severe local storms in New Eng, catalogued into 5 types.** [1957?] unpaged. entirely charts. Photostat of manuscript. B (M15 B753sy)—Sea level synoptic charts for the eastern U. S. are presented for the 50 ted cases (1899–1956), arranged by types: 1) cold season (Sept.–May) intense cold fronts harts); 2) warm season (May 15–Sept. 15) cold fronts and precold front squall lines (25 s); 3) quasistationary W-E fronts (10 charts); 4) closed upper level (500 mb) circulation harts); 5) weak circulation—usually anticyclonic (4 charts). Jet stream location at 500 evel in some instances, and the 500 mb contours and isotachs are indicated on a few of the

charts in addition to remarks on type of storm (funnel, funnel aloft, hail, etc.). Each chart giv location of storm and amount of damage reported, if any. *Subject Headings:* **1. Mesoanalys of tornadoes 2. Synoptic conditions for severe local storms 3. Tornadoes, New Engla 4. New England.**—*M.R.*

12N–385 551.515.3(76) 551.57

Dunn, Carlos R. (*Extended Forecast Section, U. S. W. B., Wash., D. C.*), **The weather a circulation of May 1957: month with severe floods and devastating tornadoes in the southe plains of the United States.** *Monthly Weather Review,* Wash., D. C., 85(5):175–182, M **1957.** 8 figs., 3 tables, 17 refs. **DWB**—More tornadoes were reported in May 1957 than in a other month on record. Over 75% of the area of the U. S. had > average rainfall, and seve regions had 300–500% of normal. Severe floods occurred in parts of Tex., Okla. and vicini A prevailing southeast flow brought large amounts of moisture into the central and southeast U. Various aspects of the circulation for the month are discussed and illustrated and features of t worst tornado week on record (May 20–26) are also outlined and illustrated by charts. *Subje Headings:* **1. Tornado statistics 2. Record tornadoes 3. Severe floods 4. Southern Plai U. S.**—*M.R.*

12N–386 551.515.3(712.

Lowe, A. B. and McKay, G. A., **A tornado at Amaranth, Manitoba.** *Canada. Meteorolo cal Branch, CIR*-3043; TEC-270, May 1, **1958.** 7 p. 10 figs., 3 refs. **DWB, DLC**—A sm tornado cut several swaths about 50 ft wide and 500 ft long as it skipped over a sparsely populat area west of Lake Manitoba. The funnel dropped from a small cumulonimbus cloud which w formed by two small heavy cumuli coming together. Thunder was heard but no precipitation w noticed. The tornado formed in a weak trough which moved southeastward, briefly distorting northwesterly flow. A shallow tongue of moist air accompanied the trough. The potentially stable air in the trough was heated from below to temperatures which would initiate convecti Synoptic factors probably favored vertical stretching in the vicinity of the trough, but these a not conclusive. *Subject Headings:* **1. Tornado, Amaranth, Manitoba 2. Manitoba, Canada.** *Authors' abstract.*

12N–387 551.515.

†Rossmann, Fritz (*Almogordo, N. Mex.*), **Die Unterschiede im physikalischen Verhalt von Tornados und Wasserhosen.** [Differences in the physical behavior of tornadoes and wat spouts.] *Meteorologische Rundschau,* Berlin, 11(2):51–54, March/April **1958.** 15 refs. **DW DLC**—A systematic comparison of the differences and similarities between tornadoes and wat spouts on the basis of extensive observational data is presented. The differences are explained terms of land and sea conditions and the physical point of view of the author's "tornado kataba wind theory." This theory assumes that in parts of clouds from which solid precipitation fa (hail) rapid cooling occurs when the hail penetrates lower, warmer layers. With the falling h an intense pressure gradient in the narrowly bounded cloud areas extends towards the grou This pressure gradient is equalized by laterally inflowing air, which begins to rotate according the law of conservation of area. Gradually the downwards developing hail channel and funnel a stabilized by equilibrium between pressure gradient and centrifugal acceleration. This proc continues below the cloud base as long as all the hail and the rain resulting from its melting evaporated by the rain adiabatic subsidence of air, and warmer air from outside traverses t channel. Both tornadoes and waterspouts are atmospheric vortexes with a length/diameter ra greater than unity. They both descend from the closed base of a well developed thunderclo within a min; in the upper part they become visible through condensation which proceeds dow wards, forming the funnel or pendant cloud. At the ground is formed a cloud of greater diame surrounding the extension of the axis of the funnel and differing from it in color, structure a density. In waterspouts this "foot cloud" is often perceived before the funnel reaches the wa surface. Both tornadoes and waterspouts usually occur in the anterior of thunderstorm clou immediately before outbreak of a storm. The two differ in the following characteristics: wat spouts are not as dangerous as tornadoes, hence they are much weaker; the kinetic energy a destructive force of the tornadoes are greater. The average life of waterspouts is shorter th that of tornadoes. The ratio of length to diameter of waterspouts is greater than that of tornado (For Eng. version, and comments, *see* 10B–165, *Met. Abs.*) *Subject Headings:* **1. Waterspo formation 2. Tornado theories 3. Tornado formation.**—*I.L.D.*

12N–388 550.375:551.515.3(7

Freier, George D., **The Earth's electric field during a tornado.** *Journal of Meteorolo* Boston, 16(3):333–334, June **1959.** 2 figs., 4 refs. **DWB, DLC**—The author reproduces a

lyzes the record of the Earth's electric field during the tornado of June 4, 1958 which struck he east and west of the Minneapolis-St. Paul area. The salient features of the record were t high frequency oscillations were present which had not been observed at this station during other thunderstorm activity during the previous year and that the record was obtained during l fair weather. The most remarkable aspect of the record between 6 and 8 p.m. is the high quency oscillation which is at least 4 cycles/min. These started very close to the time of the t reported tornado at St. Cloud and persisted for an hr after the tornado struck in Wisconsin. e best estimate of the magnitude of the oscillations as a function of tornado position would be ut 4 v/m when the tornado was 50 mi away. If the oscillations were due to tornado activity record would imply that this tornado traveled much closer to the station than to the points ere it actually caused damage. Higher frequency oscillations have been observed in ordinary nderstorms where no tornadoes were reported. *Subject Headings:* **1. Geoelectric field 2. rnado analysis 3. Minneapolis-St. Paul, Minn. area.**—*I.L.D.*

12N–389 551.594.22:551.515.3(778)

Vonnegut, Bernard, **Luminosity accompanying St. Louis tornado—Feb. 10, 1959.** *Monthly ather Review,* Wash., D. C., 87(2):64, Feb. **1959. DWB, DLC**—In response to a letter from author to the *St. Louis Post Dispatch* requesting information from readers as to luminous nomena observed during the St. Louis tornado of Feb. 10, 1959 (2:20 a.m.) 4 letters from men near the path of the tornado itself testify to continuous illumination or broad streaks of ıt, rather than strokes as is common in lightning storms. Previous accounts in the press gave criptions of "blue" or "pink" flashes and tremendous roaring. *Subject Headings:* **1. Tornado ıinosity 2. Tornado, St. Louis, Mo. (Feb. 1959) 3. Newspaper articles of tornadoes 4. rnado electricity.**—*M.R.*

Waterspouts

12N–390 551.515.31(756)

Dinwiddie, Frank B. (*Cooperative Wea. Observer, Naga Head, N. C.*), **Waterspout-tornado ucture and behavior at Nags Head, N. C., Aug. 12, 1952.** *Monthly Weather Review,* Wash., C., 87(7):239–250, July **1959.** 20 figs., ref. **DWB, DLC**—This note describes (1) a situa- leading to the anticipation of waterspout formation, (2) three spouts which subsequently med, and (3) the passage of the third spout over the observer. An interpretation of the first ut's formation, and of the third spout's lower structure, is proposed. *Subject Headings:* **1. terspout formation 2. Nags Head, N. C.**—*Author's abstract.*

12N–391 551.515.3

Orlov, E. I., **Smerch na Chernom more.** [Waterspout on the Black Sea.] *Priroda,* Mos- , 44(8):115–116, Aug. **1955.** 4 figs. **DLC**—Photographs showing various stages in the elopment of a waterspout on the Black Sea on Sept. 8, 1954 are reproduced, and are accom- ied by a detailed description of its formation and appearance. *Subject Headings:* **1. Water- uts 2. Black Sea.**—*I.L.D.*

12N–392 551.515.3

Smith, Throop (*Concord, Mass.*) and Lund, Fred, III, **Waterspouts off Cape Cod.** *Weather- e,* Boston, 9(5):174, Oct. **1956. Comments** by Charles F. Brooks, *Ibid.,* p. 174–175. **DWB** 1 p.m. EDT on Sept. 9, 1956, two observers reported seeing two waterspouts at sea off Chatham, ss. (Cape Cod), neither spout touching the water but a column of spray rising 10–20 ft above water. C. F. Brooks explains this as due to low relative humidities (56% at Blue Hill, 70 NW of Chatham), and high condensation level (3–4000 ft) in clouds but possibly 1000 ft in ut, due to lower pressure within vortex. *Subject Headings:* **1. Waterspouts not reaching 2. Cape Cod, Mass. I. Brooks, Charles F.**—*M.R.*

12N–393 551.515.3

Waterspout [in] North Atlantic Ocean. *Marine Observer,* 27(177):140–141, July **1957.** igs.—1) Aug. 22, 1956, 1905–1915 GMT, in 28°10′N, 51°36′W, an almost vertical column cended to sea level. 2) Aug. 28, 1956, 5°37′N, 44°9′W, a thin slightly curved funnel reaching n sea to heavy CuNb. 3) Sept. 12, 1956, 1430–1520 GMT, 34°12′N, 44°57′W, 2 waterspouts etches). *Subject Heading:* **1. Waterspouts.**—*C.E.P.B.*

12N–394 551.515.3(261.2)

Pichner, B., **Eigenartige Windhose im Englischen Kanal.** [Unusual waterspout in the glish Channel.] *Der Wetterlotse,* Hamburg, No. 124:236–237, No. **1957.** fig. **DWB**—An sual (10–15 m in diameter and approximately 15 m high) waterspout appeared on Nov. 3,

1957, in the English Channel near Dover, and passed at a 40 m distance from the motor sh "Remberg," being visible for about one min by the crew. The waterspout is described and co mented on. *Subject Headings:* **1. Waterspouts 2. English Channel.**—*A.M.P.*

12N–395 551.515.3(497.

§*Poje, D., **Tromba u Rovinju 19. II. 1955.** [Waterspout at Rovinj, Feb. 19, 1955.] *Yug slavia. Hidrometeorološka Služba, Vesnik,* 6(1/2): 70–80, Jan./June **1957.** 6 figs., 8 ref **DWB**—Waterspouts are not infrequent over the Adriatic (20 were observed in the 3-yr perio 1953–1956). It is, however, extremely rare for a waterspout to cross the coast line and contin over land, as was the case near Rovinj in Feb. 1955. The phenomenon is described in deta along with the synoptic situation prevailing at the time. Temperature, humidity and pressu data, and synoptic charts are presented. Theories of waterspout and tornado formation and d velopment are reviewed. *Subject Headings:* **1. Waterspouts over land 2. Waterspout form tion 3. Rovinj, Yugoslavia.**—*G.T.*

12N–396 551.515.3(45

Baldacci, Osvaldo, **Trombe marine al largo della costa settentrionale del Lazio.** [Mari water spout on the estern coast of Lazio.] *Società Geografica Italiana, Bollettino,* Ser. 8, 11(9 10):507–509, Sept./Oct. **1958.** fig. **DWB, DLC**—Twelve sketches show development and dec of waterspout (which started at the cloud level and came down to the sea, then withdrew back the cloud level). The spout was observed from the observatory at Torre Flavia, Ladispoli, Sept. 1, 1958 at 14–15 h, at a point 12°42′2″E and 41°57′7″N near Cape Linaro, Italy. At o time four spouts were observed but only one persisted. Details of local meteorology, synopt conditions and of the structure and changes in the spout are reported. No thunder or lightni was observed during this occurrence. *Subject Headings:* **1. Waterspouts 2. Cape Linaro, Ital** —*M.R.*

12N–397 551.515.3(46

Chollet, Roger, **Observation d'une trombe.** [Observation of a waterspout.] *La Météoro ogie,* Paris, Ser. 4, No. 52:277, Oct./Dec. **1958.** 2 figs. Also: Pône, M. R., **Commentair sur les conditions synoptiques régnant lors de l'observation du Commandant Chollet.** [Co mentary on the prevailing synoptic conditions during the observation of Commandant Chollet *Ibid.,* p. 280. **DWB, DLC**—Brief survey of the meteorological conditions before, during a after the passage of a waterspout observed on March 27, 1958, towards the mouth of the riv Tagus. The reproduction of the barogram shows the jump of the waterspout, which is parti ularly characteristic and important, with a successive, quasi-instantaneous fall and rise of pressu of 21 mb. Pône comments on the prevailing meteorological conditions on the Portuguese coa on this date. This situation shows the classical conditions favorable to waterspouts: stro instability and presence of important downward movements in the vicinity of the waterspou *Subject Headings:* **1. Waterspouts 2. Tagus River, Portugal.**—*A.V.*

12N–398 551.515.3(46

Chollet, Roger, **Waterspouts.** *Mariners Weather Log,* Wash., D. C., 2(5):152–156, Se **1958.** 2 figs. **DWB**—A waterspout moving ENE overtook the S.S. "Marseilles" at 6:00 p. on March 27, 1958 towards the mouth of the Tagus River, 38°40′N, 9°24′W. The waterspo passed right over the bridge of the ship. There was no rain from the cloudy sky, and the visibili was good, but heavy swells accompanied the 3 Beaufort scale WSW wind. The barometer re 757 mm (1009 mb). Reproduction of the authentic barographic trace features a drop of 16 m (21 mb) when the waterspout passed over the ship. An excellent photo of another waterspout presented. *Subject Headings:* **1. Waterspouts 2. Tagus River, Portugal.**—*W.N.*

12N–399 551.515.3(9

McCann, H. (*Met. Office, Aerodrome, Townsville*), **Waterspout sighted at Garbutt.** *Au tralian Meteorological Magazine,* Melbourne, No. 22:64–65, September **1958. DWB**—A repo is given of the waterspout sighted at Garbutt at approximately 0154 GMT on March 10, 19 Large cumiliform clouds were in the area and a heavy shower was visible to the ENE. It w in the forward portion of this cloud that the waterspout formed, with the length of the spo approximately the same as the cloud base, about 1200 ft. It moved from N to S at about 15–2 knots and was visible for 8 min. *Subject Headings:* **1. Waterspouts 2. Garbutt, Australi** —*N.N.*

Whirlwinds

12N–400 551.515.3(569.

Nir, D. (*Hebrew Univ., Jerusalem*), **Whirlwinds in Israel in the winters 1954/55 an 1955/56.** *Israel. Meteorological Service, Contributions, Ser. D,* No. 11. Reprinted from *Isra*

ploration Journal, 7(2):1–9, **1957.** 5 figs., 4 photos, 14 foot-refs. Summary p. 7–9.—The sent paper analyzes storms of extraordinarily great velocity which are rather rare in Israel l apparently limited to the coastal area. All the storms occurred at the beginning of the rainy son, in the late morning or in the early evening. The damage caused by these storms was y severe. The whirlwinds reported here affected a very limited area, only rarely more than few hundred m. It would therefore be an exceptionally fortunate occurrence, at least from point of view of meteorologists, if such a storm were to come within the orbit of observation a meteorological station. Normally this does not happen. The materials on which this note based, therefore, are eyewitness reports, assessment of damage and photographs of the storms, ne of them unsatisfactory, evaluated against the meteorological background of the time when storms occurred. *Subject Headings:* **1. Whirlwinds 2. Israel.**—*From author's introduction l summary.*

12N–401 551.515.3(426.4)

Pedoe, D. Tunstall, **A whirlwind at Flatford Mill.** *Weather,* London, 13(2):52–53, Feb. 58. 6 figs. **DWB**—A whirlwind that occurred at East Hill Pond near Flatford Mill, Suffolk 3:30 p.m. May 6, 1957 was photographed several times during its 15 min of erratic life. bris such as grass, hay, twigs, a sweater, etc. were carried high into the air and observed to ke several complete circuits (a handkerchief made 13 circuits of 20 yards diameter). Six otos are reproduced. *Subject Headings:* **1. Whirlwinds 2. Suffolk, Eng.**—*M.R.*

12N–402 551.515.3(729.87)

§Nancoo, M. E. (*Meteor. Office, Piarco, Trinidad, W. I.*), **Whirlwind in Trinidad, West dies.** *Weather,* London, 14(8).253–256, Aug. **1959.** fig. (incl. photos.) **DWB**—The develop- nts leading to the storm which occurred Sept. 11, 1958, are analyzed and the damage described. e synoptic situation for the area from the onset of the deep easterlies in June 1958 up to and luding the day after the storm is given. *Subject Headings:* **1. Whirlwinds 2. Trinidad, West dies.**—*I.S.*

Dust Devils

12N–403 551.515.3(54)

Jones, W. P. and Humphreys, R., **Dust devils.** *Indian Journal of Meteorology and Geo- sics,* Delhi, 6(1):67, Jan. **1955.** fig. **DWB, DLC**—Dust devils were observed between ellabi port and Kabda port. They were of two types (illustrated by diagrams): a fan shaped ud of sand dust "and a spout connecting to the cloud base." They revolved clockwise and ved foreward at about 5 mph. *Subject Headings:* **1. Dust devils 2. India.**—*I.L.D.*

Convective Precipitation Systems, Thunderstorms And Showers (551.515.4)

12N–404 551.515.4(741)

Day, Richard L. (*Dept. Geog. Florida Univ., Gainesville*), **Characteristics of thunderstorms Portland, Maine.** [n.d.] 37 p. 20 tables, 4 refs. typescript. **DWB**—On the basis of ather Bureau data (1905–1938) and of his own records (1936–1943, excluding 1941), the hor presents a broad survey of the subject. Included are some aspects rarely considered, in ition to an exhaustive treatment of the more conventional phases. The investigation contains tatistical analysis of thunderstorm frequencies, local and diurnal distribution, associated phe- nena (rainfall intensity, weather changes, local and synoptic weather conditions, hail, tornadoes, erspouts, cloud forms), damage, etc. Outstanding individual thunderstorms are also described. *ject Headings:* **1. Thunderstorm frequencies 2. Thunderstorm statistics 3. Portland, Me.** *T.*

12N–405 551.515.4(54)

§Malurkar, S. L., **Mechanism of thunderstorms in the tropics.** *National Institute of Sci- es of India, Delhi, Proceedings,* 15(4):161–177, May **1949.** figs., refs. Abstracted from rint. **DWB**—A general discussion distinguishing heat thunderstorms, which occur on the h-pressure belt on either side of the equator, and the frontal thunderstorms on the poleward e. Isopleths of the wet bulb potential temperature, with weather conditions, are shown for cted cases over East Pakistan. *Subject Headings:* **1. Thunderstorms 2. Tropical thunder- rms 3. East Pakistan.**—*A.A.*

12N–406 551.515.4:551.509.56

*Bleich, Eric (*Senior Meteorologist, Frankfurt,* [*Pan American Airways?*]), **Typical thunder- rm conditions over Germany.** [1950?] 7 p. Photostat charts, graphs. Mimeo. Note:

Cites contour chart for May 5, 1949.—A local synoptic study of thunderstorm occurrence Germany, especially in the Frankfurt a.M. region. The six types of steering patterns whi produce thunderstorms in this area are, in order of importance: (1) SW type, (2) SE and (3) air mass (high pressure), (4) NW type, (5) westerly (high index), and (6) E, NE and Surface, 500 mb and comparative radio sounding charts show typical situations which occurr in 1947, 1948 or 1949, the association of the thunderstorm areas with fronts, fronts aloft, et and the amount of cooling produced by the rain or hail. Forecast hints are given. *Subject Hea ings:* **1. Thunderstorm forecasting 2. Local forecast studies 3. Thunderstorm frequenci 4. West Germany.**—*M.R.*

12N–407 551.515.4:551.594.21:621.39

*Nihon Gakujitsu Shinkokai. Ninth Special Committee. **Rai no kenkyu.** [Studies thunderstorms.] Tokyo, Denkishoin, Ltd., **1950.** 194 p. numerous figs. and tables. In Japanes **DLC**—Over 10 yrs ago, NIHON GAKUJITSU SHINKOKAI organized the 9th Special Committee study the mechanism of thunderstorms and to find ways to decrease the damage caused by thunde storms. This volume is the final report, and contains chapters on meteorology of thunderstorms electrical studies and electrical damage caused by thunderstorms; and the influence of (thunde storms) on wireless communications. *Subject Headings:* **1. Thunderstorms 2. Thunderstor electricity 3. Lightning damage 4. Thunderstorm effects on radio communications.**— *H. Arakawa.*

12N–408 551.515.4(66

*French West Africa. Service Météorologique, **Statistique du nombre de jours d'orag portant sur 71 stations et sur les cinq années de 1947 à 1951 inclus.** [Statistics on the numb of days with thunderstorms recorded by 71 stations 1947–1951 inclusive.] [1952?] 25 p. **DW** —Colored relief chart, station location chart, and one chart for each month and for the yea showing days with thunderstorms, according to 8 categories. Average monthly and annual numb of days for 71 stations in the Ivory Coast, Dahomey, Guinea, Upper Volta, Mauritania, Territoi du Niger, Senegal, and Sudan (also coordinates for each station) are given in tabular for *Subject Headings:* **1. Thunderstorm frequencies 2. Thunderstorms 3. French West Afric** —*M.R.*

12N–409 551.515.4(91

Koh, Severino L., **Thunderstorms in the Philippines.** *Philippines. Weather Bureau, T Elements,* 3(6):7, June **1952.** fig. **DWB**—Histogram of mean monthly frequency of thunde storm days for Luzon, Visayas and Mindanao (1947–1951) is presented and discussed. *Subje Headings:* **1. Thunderstorm frequencies 2. Philippines.**

12N–410 551.515.4 551.594.2

Lifsic, A. M., **Zivatar és villám.** [Thunderstorms and lightning strokes.] *Természet Technika,* Budapest, 111(6):375–376, June **1952.** fig. **DLC**—General information on the form tion of thunderstorms and the mechanism of lightning strokes. The contribution of Russia scientists to the analysis of lightning is stressed. *Subject Headings:* **1. Thunderstorms Lightning strokes.**—*G.T.*

12N–411 551.515.4:087

Zolotow, Charlotte, **The storm book.** New York, Harper, **c1952.** unpaged. illus. **DWB**— An excellently illustrated (in color) description of an approaching and passing thunderstor written for primary school children, and not involving any truly scientific explanations of th phenomena. The effect on human activity is emphasized. *Subject Headings:* **1. Thunderstorm 2. Juvenile literature. I. Graham, Margaret Bloy** (*illus*).—*M.R.*

12N–412 551.515.4:0

Chicago. Univ. Dept. of Meteorology, **Thunderstorm electricity research.** Contract A 19(122)-194, Final Report, Nov. **1953.** 4 p.—An administrative report summarizing the researc projects and publications of the project, mainly the book **Thunderstorm electricity** (*see* 4.10–1 Oct. 1953, *MAB*). Difficulties encountered in getting European participation at a conference Chicago are discussed, and details of personnel employed on the contract are included. *Subje Headings:* **1. Thunderstorm Project. I. Byers, Horace R.**—*M.R.*

12N–413 551.515.4:551.509.317(5

Funada, H., **On the thunderstorm in relation to westerly wave.** *Journal of Meteorologic Research,* Tokyo, 5(9):724–729, Nov. **1953.** 10 figs., 8 refs. In Japanese; English summa

724.—Thunderstorms occurring in the Toyama area during 30 days from the 3rd decade of July the second decade of August 1952 are investigated by means of surface charts, 850, 700 and 0 mb contour charts and aerological data for Wajima. It is found that thunderstorms are apt form in the summer season in the divergence area to the east of a westerly trough and not in convergence area to the west of the trough. Even in the former case thunderstorms do not adily occur when the axis of the westerly trough is inclined to the east. *Subject Headings:* Thunderstorm forecasting 2. Toyama Prefecture, Japan.—*Author's abstract.*

12N–414 551.515.4(47,57/8)

§Galakhov, N. N., **Zimnie grozy na kontinente.** [Winter thunderstorms on the continent.] *iroda*, Moscow, 2:94–97, Feb. 1953. 2 figs. **DLC**—A study of the frequency of winter thunrstorms has been carried out by the author on a landstrip between 50° and 60°N, from the stern border of the U.S.S.R. on the Baltic Sea to its eastern frontier on the Pacific. Such rms are closely connected with typical cyclonic weather and occur mostly during heavy snowrms or during thaws accompanied by strong winds and fog. They are generally of short ration, mostly 3–4 flashes of lightning with, or sometimes without, following thunder. A map owing the distribution of probable winters with thunderstorms in the sector investigated is esented and discussed. Besides the maritime regions where the phenomenon is rather frequent, map shows some contiguous tongue-shaped areas of winter thunderstorm probability. These eas are connected with frequent cyclone paths from the W. Atlantic and SSW. Mediterranean l Black Seas. Some characteristic cases of the phenomena are described at the end of the per. *Subject Headings:* **1. Winter thunderstorms 2. Thunderstorm frequencies 3. U.S.S.R.** *A.M.P.*

12N–415 551.515.4(5)

Gleizer, M. D., **Grozy v Sredneĭ Azii.** [Thunderstorms in Central Asia.] *Electricheskie antsii*, 24(5):42–44, May 1953. fig., table, ref. **DLC**—Analysis of long period thunderstorm ta from Central Asia showed that reliable conclusions might be obtained from not less than yrs of observations. Distribution of the frequency of thunderstorms over the territory varied eatly, from 5 days per yr on the average to 30–40 days. The annual number of days with nderstorms is less than 7 days in northern Turkmenistan, increasing in an easterly direction. the major portion of the territory it varied between 10–30 days, reaching a maximum of 40 ys and even more in the mountain regions. Absence of thunderstorms is noted only in the gion of Pamir, socalled "roof of the world" where the annual number is equal to 3.02 (from yrs' data). Thunderstorms are observed during Jan.–April and during autumn in Central Asia. mmer thunderstorms are a rare phenomenon. *Subject Headings:* **1. Thunderstorm frequencies Central Asia.**—*N.T.Z.*

12N–416 551.515.4(432.2)

Kühn, Udo, **Die Gewitterhäufigkeit in Nordwest-Thüringen.** [Thunderstorm frequency in rthwest Thuringia.] *Zeitschrift für Meteorologie*, 7(8):245–248, Aug. 1953. 8 figs., 8 refs.— the basis of a 34-yr series of thunderstorm observations for the Eichsfeld region in northwest uringia, the author analyzes the annual and daily variation of thunderstorm frequency. The ationship between precipitation and thunderstorm activity is analyzed on the basis of the rainfall als for May–Aug. for the period 1907–1932. An analysis of the curves shows a considerable gree of parallelism between monthly rainfall amount and thunderstorm frequency. The secular alysis of thunderstorm activity in the period under consideration, is made. *Subject Headings:* Thunderstorm frequencies 2. Thunderstorm-precipitation relationships 3. Thuringia, rmany.—*I.L.D.*

12N–417 551.515.4:551.594.21

Workman, E. J. and Reynolds, S. E. (*New Mexico Inst. of Mining and Tech., Socorro*), **ructure and electrification.** (In: **Thunderstorm electricity.** Chic., Univ. of Chicago Press, 53. p. 139–149. 4 figs., refs. p. 148–149.)—Summarizes thunderstorm structure and electriation measurements made in the atmosphere in New Mexico before and after World War II. urteen properties of thunderstorms are listed, including 1) vertical structure without much shear cessary; 2) cloud base below and top above zero isotherm; 3) downdraft, rain and then electriation beginning when cloud top reaches −28° or −29°C; 4) the negative charge center occurring st often around −15°C; 5) the positive center forming part of a dipole above the negative, ch the dipole moment increasing as the storm develops and the upper pole moving upward and ward while the lower stays put; 6) strokes neutralizing negative and sometimes positive charges clouds; 7) charges occurring also in snow part of cloud, 8) the life span of turrets about 20–30 n for up and down movement and the lightning itself with a periodicity of 25–40 min. Charge

generation, charge separation and sublimation nuclei in relation to thunderstorms were studied i field and laboratory and results reported. Cold box, apparatus for measuring charge produced b melting hailstones, for determining potential difference between water and ice, are described an illustrated. *Subject Headings:* **1. Thunderstorm structure 2. Thunderstorm electrificatio 3. Sublimation nuclei.**—*M.R.*

12N–418 551.515.4:551.594.21(458

§Affronti, Filippo, **Eccezionale attività temporalesca in Sicilia nel quadro di due estat anomale, 1952–1953.** [Unusual thunderstorm activity in Sicily during two anomalous summers 1952–1953.] *Rivista di Meteorologia Aeronautica,* Rome 14(3/4) :24–32, July/Dec. **1954.** 6 figs 4 tables, 3 refs. Italian, French, English and German summaries p. 24.—Sicily, a region usuall recording very few storms, was in the summer of 1953 the theatre of violent electrical manifesta tions, accompanied by exceptional rainfalls. This unusual activity is associated with the genera behavior of the two summers 1952 and 1953, which showed in that region, from various stand points, complementary characteristics. *Subject Headings:* **1. Thunderstorms 2. Thunderstorm electricity 3. Rainfall extremes 4. Sicily.**—*Author's abstract.*

12N–419 551.515.4(425

Cope, Ernest, **A notable Staffordshire storm.** *Weather,* 9(9) :288, Sept. **1954.**—Account o violent thunderstorms, gale and large hailstones on June 2, 1889. *Subject Headings:* **1. Thunder storms 2. Staffordshire, England.**—*C.E.P.B.*

12N–420 551.515.4:551.50

Dawes, F. L., **They make thunderstorms their hobby.** *Weather,* 9(3) :86, March **1954** —Brief account of work of Thunderstorm Census Organization. *Subject Headings:* **1. Thunder storm Census Organization 2. Amateur observation.**—*C.E.P.B.*

12N–421 551.515.41(744

Sullivan, John J., **A storm is born.** *Boston Post Magazine,* July 25, **1954,** p. 4–6. photos illus. **DWB**—A vivid popular account of how a thunderstorm builds up in the Boston area, an the effect on various types of inhabitants. *Subject Headings:* **1. Thunderstorm formation Boston, Mass.**—*M.R.*

12N–422 551.515.4:551.506.3(546

*Bhan, S. N. (*Met. Off., Srinagar*), **Thunderstorms at Srinagar.** *Indian Journal of Meteorology and Geophysics,* New Delhi, 6(4) :333–340, Oct. **1955.** 7 tables. **DWB, DLC**—Th analysis of thunderstorms at Srinagar, 1939–1953, contains statistical data on the monthly fre quency of thunderstorms for each year during this period, distribution of total number of thunder storms each day during the months March–Oct., frequency of spells of thunderstorms, total duratio of thunderstorms during each month, and frequency of thunderstorms with different time limit *Subject Headings:* **1. Thunderstorm frequencies 2. Srinagar, India.**—*I.L.D.*

12N–423 551.515

Green, R. W., **Night storms.** *Weather,* 10(6) :209, June **1955. DWB**—Thunderstorm sometimes occur at night with low temperature and regular flashes of lightning. The Canningto storm of Aug. 18, 1924 was of this type. *Subject Heading:* **1. Night thunderstorms.**—*C.E.P.I*

12N–424 551.515.4(43

§Koubek, Rudolf, **Bouřka nad Prahou dne 13. července 1955.** [Thunderstorm over Pragu on July 13, 1955.] *Meteorologické Zprávy,* Prague, 8(5) :141–142, **1955.** 4 figs. Russian an English summaries p. 141. **DWB**—Convergence caused by a trough of low pressure over Centr Europe produced numerous thunderstorms of local character. The strongest occurred in Pragu on July 13, with a rainfall of 80 mm. *Subject Headings:* **1. Thunderstorms 2. Pragu Czechoslovakia.**—*Author's abstract.*

12N–425 551.515.41(48) 551.509.56:551.515

§†Similä, Artturi, **Über Gewitterbildung und Gewittervorhersage besonders in Skandinavie** [Thunderstorm formation and thunderstorm forecasting, especially in Scandinavia.] *Finlan Meteorologiska Centralanstalten, Ilmatieteellisen Keskuslaitoksen, Toimituksia,* No. 38, 195 67 p. 57 figs., 4 tables, bibliog. p. 66–67, eqs. Review by Béla Béll in *Időjárás,* Budapes 60(3) :177–178, May/June 1956. **DLC**—The scope of this comprehensive theoretical and em pirical treatment of thunderstorm formation and forecasting is illustrated by the table of content The meteorological and electrical conditions for thundercloud formation; The formation of ele

ity in thunderclouds; The separation of charges; The distinction between thunder and shower nds; Aerological thunderstorm tendency charts, including: Theoretical derivation of the Δ_T or; The use of the computed lability energy as a measure of the probability of thunderstorm mation; Daily variation of the Δ_T factor; The dynamically determined influence upon the Δ_T or; Thunderstorm lability (Δ_T) as a function of temperature at 850 and 500 mb; The effect moisture upon thunderstorm formation; Moisture value Δ_u as a function of temperature at mb and Analysis of thunderstorm charts and the stages of thunderstorm probability; Examples results from the use of thunderstorm tendency charts, namely: Thunderstorm formation at nts, and in upper troughs; Polar air thunderstorms; development of a thunderstorm situation y 14–19, 1950; Thunderstorm situation in a high pressure area Aug. 4–5, 1950; and Prognostic ults of the thunderstorm tendency method. *Subject Headings:* **1. Thunderstorm formation Thunderstorm forecasting 3. Scandinavia.**—*I.L.D.*

12N–426 551.515.4:629.13

U. S. Weather Bureau, **Thunderstorms, Pt. 1.** Its *Aviation Series,* No. 7, **1955.** 8 p. 5 . (incl. photos). Originally issued as Map-back article, its *Daily Weather Map,* May 4, **1955.** 2, *Ibid.,* No. 8, **1955.** 8 p. 3 figs. (incl. photo). Originally issued as Map-back article, its ily *Weather Map,* June 3, **1955. DWB**—In Pt. 1, the successive stages of the life cycle of nunderstorm, one of the most formidable weather hazards for the pilot in temperate and tropical es, are described and discussed along with multicell storms. Pt. 2 contains a discussion of lightning zones in thunderstorms, and conditions such as hail, draft and intensity, and thunder- m winds that affect aircraft operations. *Subject Headings:* **1. Thunderstorms 2. Aviation teorology.**—*A.M.P.*

12N–427 551.515.4(47)

Arkhipova, E. P., **Karty geograficheskogo raspredeleniia srednego chisla dneĭ s grozoi territorii osvoeniia tselinnykh i zalezhnykh zemel'.** [Maps of the geographical distribution the mean number of days with thunderstorms for the territory where virgin and idle lands are ng reclaimed.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia,* 88(2):189–190, rch/April **1956.** 2 maps (1 fold). **DLC**—This article contains two maps, one showing the an number of days with thunderstorms for July and the mean number of days with thunder- rms for the warm season (April–Oct.). The latter, in addition to isolines, has histograms for cific points such as Saratov, Sverdlovsk, Chkalov, Tobolsk, Tomsk, Minusinsk and Akmolinsk. *ject Headings:* **1. Thunderstorm frequencies 2. U.S.S.R.**—*I.L.D.*

12N–428 551.515.4(771)

Burke, H. N. (*MIC, WBAS, Cleveland, Ohio*), **Severe thunderstorm, Cleveland, Ohio May 1956.** *Monthly Weather Review,* Wash., D. C., 84(5):204–5, May **1956. DWB, DLC**—Map Cleveland and vicinity shows path of a destructive thunder and wind storm that caused 7 deaths 70 injuries and the toppling of about 3000 trees in the area on May 12, 1956. General situa- , details of local damage, and rainfall (which was excessive) are described in brief text. *ject Headings:* **1. Severe thunderstorms 2. Thunderstorm damage 3. Cleveland, Ohio.** *I.R.*

12N–429 551.515.4(445.9)

Favrot, Cl., **Les orages du 27 Août 1955 dans le Département du Rhône.** [Thunderstorms Aug. 27, 1955 in the Rhone Dept.] *Revue de Géographie de Lyons,* 31(1):65–69, 1956. fig. **/B**—Data on the extent of the storms, the rainfall amount and hail that fell in the region of rie, the Auvergne and Lyons valleys and in the southern part of the Rhone Dept. are presented, a map showing the damage caused by the storms is reproduced. *Subject Headings:* **1. Thun- storms 2. Thunderstorm damage 3. Rhone Dept., France.**—*I.L.D.*

12N–430 551.515.4:551.578.45

Rusanov, V. I., **Groza pri snegopade.** [A thunderstorm during snowfall.] *Meteorologiia i rologiia,* No. 4:36–37, April **1956. DWB, DLC**—This phenomenon of thunder during a snow- occurred at Tomsk, Dec. 8, 1955. The thunder was associated with the passage of a warm t. A heavy fall of wet snow and granular snow immediately preceded the thunder and con- ed during it. Strong wind prevailed when the thunder was heard. The snowfall ceased and of the sky cleared after the thunder. *Subject Headings:* **1. Winter thunderstorms 2. Thun- associated with snowstorms 3. Tomsk, U.S.S.R.**—*I.L.D.*

12N–431 551.515.4:551.553.8(547) 551.553.8:551.524.4

Tripathi, N. (*Meteorological Office, Poona*), **Thunderstorms over Poona and the possible of a squall index.** *Indian Journal of Meteorology and Geophysics,* Delhi, 7(1):7–16, Jan.

1956. 3 figs., 8 tables, 11 refs. **DWB, DLC**—Thunderstorms which occurred over Poona durin the period 1946–51 have been separated into two classes, those associated with surface squalls equ to and above 30 mph, and those thunderstorms with surface wind speeds less than 30 mph. The relative frequencies in different seasons have been worked out. Various criteria that may be c importance in causing surface squalls in association with thunderstorms have been examined. parameter, representing the difference of temperature between the dry bulb at 800 mb and th temperature of a saturated parcel of air in equilibrium with environment at 600 mb (the approx imate freezing level) when brought down moist-adiabatically to the 800 mb level, which may b conveniently called a "squall index'," has been found to be significant in determining whether c not the thunderstorm of a particular day is likely to be associated with a strong squall. *Subje Headings:* **1. Thunderstorms 2. Thunder squalls 3. Squall index 4. Poona, India.**—*Author abstract.*

12N–432 551.515.4(73

U. S. Weather Bureau, **Aeronautical climatology: thunderstorms.** Its *Aviation Serie* No. 16, **1956.** 8 p. 5 figs. Originally issued as Map-back article, its *Daily Weather Ma* Feb. 1, **1956. DWB**—The paper shows how the frequency of thunderstorms varies with locatio and season in the U. S. Five charts show the average number of days with thunderstorms durin each season and during the year. Comments as to the seasons, hours and location of the mo frequently occurring thunderstorms are included. *Subject Headings:* **1. Thunderstorm fr quencies 2. United States.**—*A.M.P.*

12N–433 551.515.4(494

*Ambrosetti, Flavio; Bider, Max and Bouët, Max., **L'orage en Suisse.** [The thunderstor in Switzerland.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* 8(2):172–18 **1957.** 2 figs., 5 tables, 21 refs. French, German and English summaries p. 172. **DWB**—Thu derstorms at reliable stations in Jura (2), Plateau (4), Alps (4) and South (1) are tabulated number of days (month and yr), sequences of successive days, and diurnal variation. Types storm (local, frontal, instability) are discussed but are difficult to distinguish; better classificatio are by direction of approach (mainly SW) and synoptic situation. *Subject Headings:* **1. Thunde storms 2. Switzerland.**—*C.E.P.B.*

12N–434 551.515.4(494.4):551.575.3

Bouët, Max, **L'orage et le brouillard à la Vallée de Joux.** [Thunderstorms and fog in th Joux Valley.] *Société Vaudoise des Sciences Naturelles, Bulletin,* 66(295):433–439, Aug. 195 fig., 2 tables, 10 refs. **DLC, DWB**—Fifty-five yrs (1901–1955) of meteorological observatio made at Sentier by Samuel Aubert and Pierre Baud have been analyzed from the point view of thunderstorms and fog. The study of the data shows that there are 36 days per yr wi thunderstorms, the activity usually reaching its maximum at 5 p.m. Fog appears 41 times ea yr, and three times out of four, in the form of radiation fog. *Subject Headings:* **1. Thunde storm frequencies 2. Fog frequency data 3. Joux Valley, Switzerland.**—*Transl. of autho abstract.*

12N–435 551.515.42:551.577(77

Changnon, Stanley A., Jr., **Thunderstorm-precipitation relations in Illinois.** *Illino Water Survey, Report of Investigation,* No. 34, **1957.** 24 p. 17 figs., 7 tables, 6 refs. **DL** (GB705.I3A3)—Because first-order stations in Ill. are too few in number to yield thunderstor data sufficient for depicting areal variations in detail, data from cooperative substations we evaluated for the present study. Three factors control the annual geographic distribution thunderstorms in Ill., which exhibits a decrease from south to north: the altitude of the sun a moisture source, which are the more important factors; nocturnal advection of warm air duri the warmer half year, which is of secondary importance. The occurrence of nocturnal thund storms in western Ill. causes the northwestward bending of isoceraunic lines (lines of eq thunderstorm frequency) away from E-W latitudinal positions. A latitudinal orientation isoceraunic lines with a northward decrease is present in all months except June and July, w the lines assume a N-S orientation with occurrences decreasing eastward across Ill. Southern a western Ill. have more thunderstorms than eastern and northern Ill., with the former receivi over 42% of the normal annual precipitation as the result of thunderstorms. The % of nor precipitation due to thunderstorms decreases from W-E, whereas the number of thunderstorms a amount of thunderstorm precipitation decrease from S-N. Thunderstorm occurrences and thund storm precipitation are highest in Ill. during June, but the % of normal precipitation due thunderstorms has a statewide maximum in July. Dec. has the fewest number of thunderstor and the lowest monthly amount of thunderstorm precipitation. *Subject Headings:* **1. Thund**

orm rainfall 2. Thunderstorm-precipitation relationships 3. Illinois.—*From author's abract.*

12N–436 551.515.4(468.1)

*Due Rojo, Antonio, **Nota estadística sobre el régimen de tormentas en Granada.** [Statisal note on the thunderstorm regime in Granada.] *Urania,* Barcelona, 42(245):90–94, Jan./June 957. 2 figs., table. **DWB**—A statistical study of thunderstorms at Granada for 54 yrs (1903–) including an analysis of their variability during each month (in graphic and tabular form). *ubject Headings:* **1. Thunderstorm statistics 2. Thunderstorms 3. Granada, Spain.**—*M.R.*

12N–437 551.515.4:551.507.352

§Imianitov, I. M.; Kulik, M. M. and Chuvaev, A. P., **Opyt issledovaniia grozovykh zon v zhnykh raĭonakh Evropeĭskoĭ territorii Soiuza SSR i v Zakavkaz'e.** [Investigations of thunerstorm zones in the southern regions of European U.S.S.R. and the Transcaucasus.] *Leningrad. lavnaia Geofizicheskaia Observatoriia, Trudy,* No. 67(129):3–32, **1957.** 22 figs., 3 refs. **DWB**—During the summer of 1953 airplane flights were carried out in the thunderstorm zone in the ostov Region (Ukraine), in the Kuban and in the Transcaucasus, in order to investigate the ectrical properties of the free atmosphere, including those of clouds. The instrumentation of the rcraft used in this study, the execution of the flights including the approach and passage through arious thunderstorm clouds and frontal zones, are described for specific flights. The synoptic tuation during each flight is described with the aid of synoptic maps; potential gradient values ithin the clouds, velocity of the aircraft and degree of bumpiness are presented in graphs. The otential gradient in areas free of clouds or rain does not usually exceed 1 v/cm at elevations bove 250 m. Even considerable turbulence at elevations above 200 m does not produce a perptible change in the field distribution. In ordinary cumulus clouds the potential gradient is round 2–5 v/cm, sometimes 15 v/cm. In high cumulus clouds at elevations of 7000 m, which o not produce an image on the radar screen, no extensive electrical fields were noted. In these, e potential gradient is about 20 v/cm. The vertical currents in these clouds had a velocity of -7 m/sec. In highly convective clouds producing a radar image, the potential gradient was as gh as 100 v/cm. In developed cumulus rain clouds and during flights under thunderstorm clouds e potential gradient reached 100–150 v/cm. Every cloud does not offer the same degree of anger to aircraft, but danger is present where a potential gradient exceeding 50 v/cm is reached clouds, giving radar screen images and causing bumpiness above normal. *Subject Headings:* **Thunderstorm flights 2. Synoptic conditions for thunderstorms 3. European U.S.S.R. Transcaucasian S.S.R.**—*I.L.D.*

12N–438 551.515.4:551.578.7(479.22)

Laĭkhtman, D. L., **Soveshchanie po voprosam issledovaniia grozovo-gradovykh iavleniĭ Alazanskoĭ doline.** [Conference on the problem of investigating thunderstorms and hailstorms the Alazansk Depression.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.,* No. 10:1273, Oct. **957. DLC**—A report of a conference on thunderstorm and hailstorm phenomena that was held the Institute of Geophysics of the Academy of Sciences of the Georgian S.S.R. on April 9, 957. Papers were delivered on present knowledge of thunderstorms and hailstorms and methods r preventing them, studies of thunderstorms in Alazansk Depression, etc. *Subject Headings:* **Thunderstorm research 2. Hailstorms 3. Alazansk Depression, Georgian S.S.R.**—*I.L.D.*

12N–439 551.515.41:551.543

Asani, G. C. (*Met. Office, Poona*), **Unusual pressure fluctuations associated with thunderorms.** *Indian Journal of Meteorology and Geophysics,* 9(2):117–132, April **1958.** 10 figs., 2 bles, 4 refs. **DWB, DLC**—Based on autographic records of about 18 yrs (1935–1952) at egumpet Airport the author feels that a new approach to the problem of pressure dip is necessary, nd he proposes three categories into which a large number of unusual pressure patterns falls. number of unusual pressure patterns is presented, along with other relevant records which ppear to contribute to a better understanding of observational facts related to thunderstorm pres-ıres. *Subject Headings:* **1. Pressure fluctuations 2. Thunderstorm development 3. Thunerstorm-pressure relationships 4. Begumpet Airport, India.**—*N.N.*

12N–440 551.515.4(548)

Balasubramanian, C. and M. Stephen Dorairaj, (*both, Agricultural Met. Section, Coimbatore*), **ignificance and frequency of occurrence of thunderstorms at Coimbatore.** *Indian Journal of eteorology and Geophysics,* Delhi, 9(4):359–362, Oct. **1958.** fig., 4 tables, 5 refs. **[Comment]** K. Raghavan and **[Reply by]** Balasubramanian, *Ibid.,* 10(3):363–364, July 1959, *MAB.* **WB, DLC**—In this paper a preliminary attempt has been made to assess the significance and fre-

quency of occurrence of thunderstorms at Coimbatore. A thunderstorm has been taken by the authors as a phenomenon, accompanied by thunder and lightning. Of course, during daytime the lightning might not be visible. Cases of thunderstorms with and without rain have been considered. *Subject Headings:* **1. Thunderstorm frequencies 2. Coimbatore, India.**—*Author's abstract.*

12N–441 551.515.41:551.524.7(439.1)

Béll, Bela, **Bedeutung des Null-Grad Niveaus für das Entstehen der Gewitter.** [Significance of the 0° isotherm in the forming of a thunderstorm.] *Időjárás,* Budapest, 62(1):3–10, Jan./Feb. **1958.** 2 figs., 5 tables, 5 refs. English summary p. 3. Hungarian summary p. 10. **DLC**—An examination of the data of thunderstorms and rains from 1951–1957 shows that there is a considerable number of thunderstorms during the summer half year near Budapest, and the amount of precipitation on thunderstorm days exceeds that on rainy days without thunderstorms. Within the scope of aerological research, investigations on summer thunderstorms were carried out by the author in order to state whether any characteristic differences could be found between thunderstorms and rains in respect to the level of the 0° isotherm. It is shown that there is very little probability of a thunderstorm's forming when the 0° isotherm is situated under 2000 m in spring and under 2800 m in summer. On the basis of the observational material of 7 yrs it may be stated also that the 0° isotherm, when under 1600 m, excludes the forming of thunderstorms during the whole summer half year (April–Sept.). The insignificant fluctuations of the 0° isotherm observed during thunderstorms are restricted to its lower limit. This statement is in accordance with the condition basic to the formation of squall clouds, according to which the 0° isotherm must be at a considerably higher level than the lower boundary of the cloud. *Subject Headings:* **1. Zero isotherm 2. Thunderstorm formation 3. Budapest, Hungary.**—*Author's abstract.*

12N–442 551.515.4:551.501.83

Holzer, R. E. (*Inst. of Geophysics, Univ. of Calif., Los Angeles*), **World thunderstorm activity and extremely low frequency sferics.** *Conference on Atmospheric Electricity, 2nd, Portsmouth, N. H., May 1958, Proceedings,* issued **1958.** p. 599–602, fig., 7 refs., eq. **DWB** (M(055)C748pr)—During a series of measurements directed toward determining the physical cause of natural electromagnetic signals in the low audiofrequency range, Holzer and Deal found that the mean signal amplitude in the frequency band from 30 to 120 c/s exhibited a simple, systematic diurnal oscillation at a station in the Borrego Desert of Southern Cal. In the cooler months of the year when the nearest large thunderstorm center was more than 60° from the observing station, the diurnal oscillation was similar in relative amplitude and phase to that of the atmospheric electric air-earth current observed over the oceans. The result suggested that the electromagnetic signals were sferics from worldwide thunderstorm activity. However, the approximate proportionality between the air-earth current density and the mean electromagnetic signal amplitude was somewhat surprising in view of the large differences in the distance of the thunderstorms from the observing station. The above correlation was not found in frequency bands above that in which it was first reported. The present paper is an attempt to find an approximate quantitative explanation of these observations. *Subject Headings:* **1. Thunderstorm activity 2. Sferics from thunderstorms 3. Borrego Desert, Southern Calif.**—*From author's introduction.*

12N–443 551.515.4

Lebedev. A. N., **Prodolzhitel'nost' groz na ogranichennykh uchastkakh territorii.** [Thunderstorm duration over delimited areas.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy,* No. 85:112–121, **1958.** 7 figs., 5 tables, 2 refs. **DLC**—The principal thunderstorm activity data have usually been expressed as the mean number of days with thunderstorms, over long periods of time, based on data from a number of meteorological stations. These data are insufficient for the solution of many practical problems. This is particularly true in aviation weather services, weather services for telecommunication lines, etc. In these instances, data must be general for a certain limited area. A study, conducted along the Volga in the Gorki Region, has revealed that the probability of a thunderstorm's occurring in an area within a radius of 100 km is 2–3 times greater than at a single station, and in an area within a radius of 200 km, the probability is 3–4 times greater. *Subject Headings:* **1. Thunderstorm activity 2. Gorki Region U.S.S.R.**—*N.G.*

12N–444 551.515.4(529)

Liu, Hung-hsi, **A study of thunderstorms.** *Meteorological Bulletin,* Taipei, Formosa, 4(2) 24–29, June **1958.** 3 tables, 9 refs., eqs. In Chinese; English summary p. 24. **DLC**—This paper gives a general classification of thunderstorms and the associated weather phenomena which occur in thunderstorms. A theoretical discussion of the pressure and wind fields is briefly introduced. Climatological study of the distribution of thunderstorms in Taiwan relating to the topographi

atures is also discussed. *Subject Headings:* **1. Thunderstorms 2. Thunderstorm distribution Formosa.**—*Author's abstract.*

12N–445 551.515.4(47)

Moiseev, A. P. and Kuznitsyn, E. A., **Rannie vesennie grozy.** [Early spring thunderstorms.] *riroda,* Moscow, 47(3):125–126, March **1958. DLC**—Two rare instances of thunderstorms hich occurred in European U.S.S.R. are described. One occurred in Moscow on March 20 etween 1 and 2 a.m. The rain lasted a short while, and was accompanied by a squall and some ghtning flashes; it ultimately turned into snow. By day the sky on March 19 was summery; fter sunset, the western sky acquired a typical prethunderstorm aspect. The following morning March 20) a strong southerly wind prevailed and squall rain alternated with snow. The mean ate of gust thunderstorms for 1882–1952 was May 12. The earliest date of a thunderstorm was pril 11, 1951. The other thunderstorm was observed on March 29, 1955 at Slobodsk, Kirov egion. The thunder which was associated with snowfall was followed by hail. *Subject Headngs:* **1. Thunderstorm data 2. Spring thunderstorms 3. U.S.S.R.**—*I.L.D.*

12N–446 551.515.42:551.577.11 551.594.21

†Moore, Charles B.; Vonnegut, Bernard et al., **Results of an experiment to determine initial recedence of organized electrification and precipitation in thunderstorms.** *Conference on tmospheric Electricity, 2nd, Portsmouth, N. H., May 1958, Proceedings,* issued **1958.** p. 333–360. 6 figs. (incl. photos), 25 refs. **DWB** (M(055)C748pr)—Observations of summer thunderstorms eveloping over Mt. Withington, N. M., show that electrification begins early in the cloud's deelopment. Measurements within and above the cloud show that electric charge accumulations imilar in polarity to those of the mature storm begin to form before any echo can be seen with n X-band radar and before any electrical perturbations can be detected on the mountain summit eneath the cloud. Measurements of potential gradient were made within the cloud with radioondes supported on tethered balloons. It was found that the gradient within the cloud was far rger than that outside the cloud and that it reached values as high as 20 V cm^{-1} before the ppearance of the radar echo. Measurements made from an airplane flying over the top of the rowing cloud showed that here the fair weather potential gradient reversed before any radar echo ould be seen. The rapid rise of the cloud tops and the tension on the line holding the tethered alloon showed that the development of the initial electrical activity was closely related to conective activity. The initial radar precipitation echo within the cloud was frequently in the form f a hollow, inverted cup that usually filled in and became completely reflecting in a few minutes. *ubject Headings:* **1. Thundercloud electrification 2. Thunderstorm precipitation 3. Elecicity measurements in clouds 4. Mt. Withington, N. M. I. Botka, Alexander T.**—*Author's bstract.*

12N–447 551.515.4:551.578.7:632.13

Les orages de grêle en 1958. [Hailstorms in 1958.] *Phytoma,* Paris, 10(102):28–31, Nov. **958.** 6 photos. **CU, DA**—Short account and description of damage caused by some particularly iolent storms in France in 1958. In this country, in 1958, from the end of spring to the end of ummer, weather was exceptionally stormy. Hailstorms were characterized both by their frequency nd severity. *Subject Headings:* **1. Hailstorms 2. Hail damage 3. France.**—*A.V.*

12N–448 551.515.4:551.578.4(477.9)

Burtsev, D. A. and Belashchenko, N. A., **Groza so snegom v Krymu.** [Thunderstorm with now in the Crimea.] *Meteorologiia i Gidrologiia,* Leningrad, No. 8:32, Aug. **1959.** ref. **DWB, DLC**—On Jan. 12, 1959, in Simferopol cumulonimbus clouds accompanied by snow were observed or several hours. The clouds developed and dispersed quickly. The period between individual hunder claps did not exceed 30–35 min. Radiosonde observations at 9 and 15 hrs indicated that he atmosphere was characterized by moisture stability between 1090 and 3200 m. The vertical emperature gradient was 0.75°/100 m between 1000 and 1500 m, and 0.78°/100 m between 1500 nd 3000 m; in the lower km it was 0.5°/100 m. Diurnal heating or intense dynamic turbulence ould break up moisture stability. Pibal data at 15 hrs indicated a break of the wind vector up o a height of 1000 m. By computing the thermal equivalent of the vertical wind vector gradient nd constructing a thermodynamic stratification curve, it was shown that in the 0–700 m layer the tmosphere was dry adiabatic with the condensation level at 550 m; in the 700–1090 m layer it as neutral with respect to moisture stability; and in the 1090–3200 m layer it was unstable with espect to moisture. The dynamic turbulence in the lower km was an adequate fulcrum for releasing nstability and producing cumulonimbus clouds; also the warming of cold air favored convection. *ubject Headings:* **1. Thunderstorm activity 2. Snowstorms with thunder 3. Simferopol, Ukrainian S.S.R.**—*I.L.D.*

12N–449 551.515.4:551.576.1:551.594.221

Papet-Lepine, Jacques, **La loi de décharge des nuages orageux par coup de foudre.** [Law of discharge of thunder clouds by lightning.] *Arkiv för Geofysik,* Stockholm, 3(5):79–96, 1959. 8 figs., 18 refs., eqs. French summary p. 79. **DLC** (QC801.A7)—The author shows to what extent a flash of lightning can be turned into a radiant conductor. The distribution of current has been investigated, taking into account the resistance of the lightning channel. A simple formula can be arrived at only if one accepts Hallén's theory of antennas in respect to a zero order approximation. Finally, consideration is given to Volterra's integral equation, connecting the field with the current, which leads again to the classic expression of Biot and Savart: $R = O$. On the basis of experimental oscillograms, different examples are given, as well as resulting conclusions regarding the current and the charge. *Subject Headings:* **1. Electrical charge separation in cumuli 2. Thunderstorms.**—*Transl. of author's summary.*

12N–450 551.515.41(47...)

Zuev, V. M. and Karpova, L. M., **Mikrogroza v podmoskov'e.** [Microthunderstorm near Moscow.] *Priroda,* Moscow, No. 11:113–114, No. 1959. fig. **DLC**—On June 28, 1959 about 7 a.m. a thunderstorm arose suddenly near Moscow. It lasted 15–20 min and the rain fell over an area of 500 × 500 m². Morning storms are rare in the latitudes of Moscow. Thunderstorms occurred somewhat later that same day in nearby towns. In the very early morning hours of June 28 there was considerable radiational cooling in the presence of a cloud free sky; profiles of vertical temperature showed a temperature inversion and high relative humidity at the surface. A dense fog formed. With sunrise there was rapid heating and convection currents developed. The peaks of the elevations, devoid of forests, warmed up most rapidly and cumulus clouds formed over them. The fog moved there from all sides. The temperature profile became approximately uniform but the air temperature was not high, so that a low condensation level resulted. Cumulus clouds formed at a height of 40–50 m, these attained their greatest dimensions at 7 a.m., but their area remained small. The rainfall amounted to 1 mm. The electrical discharges were very large and were frequently directed downward. *Subject Headings:* **1. Thunderstorm formation 2. Moscow, U.S.S.R.**—*I.L.D.*

Anticyclones (551.515.7)

12N–451 551.515.7(52)

Fujita, Tetsuya, **Disturbances observed in the vicinity of the Okhotsk Sea anticyclone.** *Tobata, Japan. Kyushu Institute of Technology, Bulletin,* No. 1:65–73, March **1951.** 16 figs., 6 refs., eqs. Abstracted from reprint. **DWB**—In this paper the author presents his idea that the Okhotsk Sea anticyclone must be a high type one with anticyclonic circulation even in the highest altitude of the troposphere, and that the cold air mass in the wet season of Japan will come from the North Pole region, passing in the western portion of the well developed cold trough over the Aleutians. Some interesting disturbances such as blocking of westerly trough, föhn in free atmosphere, cold cyclone in the cold trough over the Aleutians are introduced here, in order to reveal the upper air condition over the northern area. *Subject Headings:* **1. High level anticyclones 2. Atmospheric disturbances 3. Okhotsk Sea, U.S.S.R.**—*Author's abstract.*

12N–452 551.515.7(52):551.524:551.577.35

Sakai, H., **On the relation between path of travelling anticyclone in spring and air temperature and rainfall amount in summer in Tohoku District (Supplement).** *Journal of Meteorological Research,* Tokyo, 5(6):489–493, July **1953.** 7 figs. **DWB**—The author investigated variations in the situation of the frontal zone near Japan between the Ogasawara anticyclone and the Polar air mass in summer, and obtained the following results: (1) There is a high simultaneous correlation between the situation of the frontal zone in summer and temperature and rainfall amount in summer in Tohoku District. (2) The situation of the frontal zone in summer can be predicted by the path of the traveling anticyclone in spring. (For earlier paper, *see* 6.4–153, April 1955, *MAB.*) *Subject Headings:* **1. Anticyclone movement 2. Air temperatures 3. Rainfall variations 4. Tohoku District, Japan.**—*Author's abstract.*

12N–453 551.515.71(26)

Bayardelle, Maud and Roulleau, J., **Sur l'entretien des anticyclones océaniques.** [On the maintenance of oceanic anticyclones.] *Journal Scientifique de la Météorologie,* Paris, 7(26):214–220, April/June **1955.** 4 figs., 4 refs., eqs. French, English and Spanish summaries p. 214. **DWB**—In a study aimed at showing the mechanism whereby oceanic anticyclones are generated and maintained, data from ocean station *E* (35°N, 48°W) and *D* (44°N, 41°W), for 27 and 37 months during 1949–51 are analyzed in connection with daily synoptic charts of the Météorologie Nationale. The angle of the wind with the isobars, stability of the air masses, and height of friction layer, frictional effects of the wind on the sea in relation to currents (and the effect of

e currents on wind angle with isobars) are the considerations which enter into the analysis. alues of ϕ are given for points D and E for $\Delta = 210°$ and 270°. *Subject Headings:* **1. Anti-yclogenesis over oceans 2. Ocean weather stations D and E.**—*M.R.*

12N–454 551.515.7:551.509.33:551.557.2

Sekine, Y., **On the upper air anticyclone of horse latitudes in the neighborhood of Japan, t. 2.** *Journal of Meteorological Research*, Tokyo, 7(9):529–534, Oct. **1955.** 6 figs., 2 tables, refs. In Japanese; English summary p. 529. **DWB, DLC.** Also issued in: *Sendai, Japan. entral Meteorological Observatory, Bulletin of the Meteorological Society for Research of Tohoku istrict*, 9(1):7–12, Nov. **1955.** In Japanese; English summary p. 7. **DWB**—As a sequel to s previous paper(*see* 6.4–154, April 1955, *Met. Abs.*), the author investigated the mean upper r anticyclonic belt in horse latitudes and its effect on the weather of Tohoku District from spring autumn, by using the monthly mean contours (690 mm-Hg and 530 mg-Hg surfaces). For the recasting of monthly mean temperature in autumn, attention must be paid to the continental anti-clones, while in summer the state of the anticyclones in horse latitudes becomes an important ctor. The position of anticyclones of horse latitudes in April and July seems to be related the summer temperature in Tohoku District. *Subject Headings:* **1. Anticyclones 2. Meri-onal circulation 3. Tohoku District, Japan.**—*From author's abstract.*

12N–455 551.515.71(5-011)

Chang, Xuai (*Dept. Ocean., Shantung Univ.*) and Sh, Giu-en (*Central Met. Inst.*), **The ac-vity of the anticyclone in Eastern Asia.** *Acta Meteorologica Sinica*, Peking, 28(3):167–174, **957.** 3 figs., 4 tables. In Chinese; English summary p. 174. **DLC**—Using synoptic data for 951–1955, a statistical investigation of anticyclones in Eastern Asia is made. The classification ccording to path), frequency, central intensity, variation of the intensity and the velocity of the nticyclones over Eastern Asia are given. *Subject Headings:* **1. Anticyclones 2. Eastern Asia.** *-Author's abstract.*

12N–456 551.515.71:551.589

Baur, Franz, **Die jahreszeitliche und geographische Verteilung der blockierenden Hoch-ruckgebiete auf der Nordhalbkugel nördlich des 50. Breitenkreises im Zeitraum 1949–1957.** The seasonal and geographic distribution of blocking highs over the Northern Hemisphere north the 50th parallel during the period 1949–1957.] *Időjárás*, Budapest, 62(2):73–82, March/April **958.** 9 figs., 2 tables. English summary p. 73. Hungarian summary p. 81–82. **DWB, DLC** -Blocking highs which occurred north of 50°N lat. are listed in Polar diagrams divided into elds: 10° × 5° from 50–80°N; 30° × 5° from 80–85°N; and 4 triangles between 85 and 90°, r each of 8 seasons, lasting 45 or 46 days. Characteristics of the seasonal and latitudinal dis-ibution are discussed. *Subject Headings:* **1. Blocking anticyclones 2. Synoptic climatology stagnant anticyclones 3. Northern Hemisphere.**—*G.T.*

12N–457 551.515.7:551.515.13:551.509.311

Klein, William H. and Winston, Jay S. (*U. S. W. B., Wash., D. C.*), **Geographical frequency troughs and ridges on mean 700-mb. charts.** *Monthly Weather Review*, Wash., D. C., 86 9):344–358, Sept. **1958.** 48 figs., 2 tables, 18 refs. **DWB, DLC**—The geographical frequencies occurrence of troughs and ridges on both 5-day and 30-day mean 700 mb charts for the Northern emisphere during a long period of record are presented for individual months. Many regions maximum and minimum frequency show a close relationship to trough and ridge positions on ng period mean, or normal 700 mb charts. However, even a cursory inspection of these fre-ency charts shows that they yield considerably more information for both the practising fore-ster and the research worker than can be derived solely from normal maps. Preferred trough d ridge locations and their seasonal changes appear to be related largely to land-sea boundaries th their associated thermal influences and also to prominent orography. *Subject Headings:* **Troughs and ridges 2. Trough frequencies 3. Ridge frequencies 4. Northern Hemis-here.**—*Authors' abstract.*

12N–458 551.515.71:551.524.2:551.542

Kalmykova, N. M., **O formirovanii kontinental'nykh statsionarnykh antitsiklonov pod iianiem termicheskikh uslovii podstilaiushcheĭ poverkhnosti.** [Formation of continental tionary anticyclones under the influence of thermal conditions in an underlying surface.] *oscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 74:25–31, **1959.** 3 figs., table, 8 refs., 12 s. **DWB**—The connection between the pressure and the thermal fields in the formation of asonal centers of activity in the atmosphere is considered. The basis of the mathematical analysis the static equation of the atmosphere. The author concludes that the winter temperatures cor-

respond to high pressure, and the summer temperatures to low pressure. *Subject Headings:* **1. Anticyclogenesis 2. Temperature-pressure relationships.**—*B.J.G.*

12N–459 551.515.71:551.54

Petrenchuk, O. P., **Nekotorye svoĭstva poleĭ davleniia v baricheskikh obrazovaniiakh ellipticheskimi izobarami.** [Some properties of pressure fields in baric formations with ellipti isobars.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy,* No. 93:21–28, **1959.** figs., 4 tables, 4 refs., 16 eqs. Russian summary p. 28. **DWB, DLC**—The author examines th influence of the varying curvature of the trajectory of a particle upon the variation of pressure a the Earth in quasistationary anticyclones with elliptical isobars. The deviation of the isobars fro a circle causes a variation of the critical trajectory and the appearance of ageostrophic component of wind velocity. An equation for calculating the variation of pressure at the earth from th variation of the curvature of particles in quasistationary anticyclones with elliptical isobars i derived. The variations of pressure calculated for different radii, are presented in a table and theoretical model of the field of pressure tendency in an anticyclone is illustrated. The model show that the absolute magnitudes of pressure tendencies increase in a direction towards the center an there is a regular succession of regions of positive and negative tendencies; during the movemen in a direction towards an increase in curvature, the pressure tendencies are negative, but in th direction of a diminution in curvature they are positive. These phenomena are explained by mean of formulas for the horizontal component of wind deviation from the gradient. The results o calculations of the variations of the tangential and normal components of wind deviation are pre sented. The results of mean pressure tendencies in different parts of an anticyclone for 1 anticyclones are given. A good correspondence was found between actual and calculated value of the field of pressure tendencies. *Subject Headings:* **1. Pressure fields 2. Anticyclones.**— *I.L.D.*

12N–460 551.515.71:551.524.2/

Petrenchuk, O. P., **Osobennosti temperaturnogo polia v antitsiklonakh.** [Characteristic of temperature fields in anticyclones,] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy* No. 93:47–55, **1959.** 2 figs., 3 tables, 7 refs. **DWB, DLC**—The variation of temperature con trast with height, in anticyclones within the entire troposphere, was investigated on the basis o radiosonde observations of 15 anticyclones over European U.S.S.R. The mean horizontal contras of temperature over the central, western, eastern and southern parts of an anticyclone as a func tion of its development is presented. With intensification of anticyclones a considerable hori zontal contrast of temperature was observed within the entire troposphere over the central, south ern and western parts. This contrast persisted for a series of anticyclones, also during transitio to the stratosphere, but it reversed its sign. In the anticyclones investigated, which were pre dominantly fall-winter anticyclones, there were thick stable layers with $\gamma < 0.6°C/100m$. Thei frequency in most cases declined with the development of the anticyclone; on the other hand th frequency of inversions increased. *Subject Headings:* **1. Temperature fields in anticyclone 2. Anticyclones 3. European U.S.S.R.**—*I.L.D.*

Air Masses And Fronts (551.515.8)

12N–461 551.515.8(8

§Rico Negretty, José J. (*Chief, Synoptic Section, Met. Serv. of Bolivia*), **La teoría de l masas de aire y los frentes en Sudamérica.** [Theory of air masses and fronts in Sout America.] La Paz, Bolivia [Servicio Meteorológico de Bolivia], **1946.** 31 p. 23 figs., 3 table 13 refs. Mimeo. **DWB**—A general discussion, but supported by considerable statistical data on frequency of air masses, fronts, etc., of the synoptic conditions affecting South America, an Bolivia in particular. Oceanic and atmospheric circulation, air masses (Polar, tropical, equatorial and superior) and their geographical limitations, fronts, frontal and lee cyclones and characteristic of air masses, are discussed and illustrated by schematic diagrams, cross sections and sampl synoptic charts. *Subject Headings:* **1. Synoptic studies 2. Air mass frequencies 3. Front 4. Bolivia 5. South America.**—*M.R.*

12N–462 551.515.8:551.589.1(5

§Lautensach, Hermann (*Stuttgart*), **Luftmassen und Fronten in Süd- und Ostasien.** [Ai masses and fronts in south and east Asia.] *Leben und Umwelt,* Aarau, Switzerland, 6(7):145–152 April 1950. fig. **DLC**—A short history of the development of concepts of atmospheric circula tion and frontal analysis. On the basis of investigations published by E. H. G. Dobby in *Geo graphical Review* (1945) the author describes and illustrates the weather situation over souther and eastern Asia for each month (pressure, temperature, wind, and precipitation). The monsoo circulation, its causes and boundaries, and typhoons are especially considered in the light o

noptic weather conditions. *Subject Headings:* **1. Air mass characteristics 2. Synoptic climatology 3. Southeast Asia.**—*N. T. Zikeev.*

12N–463 551.515.8(548)

Severe thundersquall over Begumpet on 17 May 1951. *Indian Journal of Meteorology and Geophysics,* 2(4):294–295, Oct. 1951.—Description of a thundersquall; maximum recorded wind speed was 73 mph and rise of pressure was 3.3 mb. *Subject Headings:* **1. Thundersqualls 2. Begumpet Airport, India.**—*A. Assur.*

12N–464 551.515.81(4)

Vernic, Radovan, **Termodinamicke karakteristike zracnih masa.** [Thermodynamic characteristics of air masses.] *Jugoslavenska Akademija Znanosti u Umjetnosti, Zagreb, Rasprave Odjela za Matematicke, Fizicke i Technicke Nauk,* 1(3), **1952.** 35 p. 8 figs., 13 maps (in pocket), 8 tables, 5 refs. In Croatian; added t-p. and summary p. 34–35, in English. **DWB**—Discussing in detail adiabatic invariants as thermodynamic characteristics of air masses, the quantity $SS = TT + U$ was finally adopted and its relation to the wet bulb temperature and the equivalent temperature is shown. An air mass analysis for 1947–48 is made, giving a detailed list of the origins of the air masses and presenting sample maps, showing the distribution of fronts. The annual variation of SS and its standard deviation σ is computed for each air mass. The mean $= \pm 1.5$, while the mean difference between the characteristics SS is 3.5. Finally the effect of the European monsoon on the lowering of the temperature in July is discussed. *Subject Headings:* **1. Air masses 2. Thermodynamic characteristics of air masses 3. European monsoons Europe.**—*A. Assur.*

12N–465 551.515.8:551.509.33

Yanagiya, K., **On the analysis of frontal zone and its application for long-range forecast.** *Journal of Meteorological Research,* Tokyo, 4(7):411–415, Oct. **1952.** 4 figs. In Japanese; English summary p. [26]–[27].—The author investigates the variations of frontal zones in winter, applying results of the analysis to long range forecasting. He finds that summer weather in Tohoku District bears a close relationship to the state of the frontal zone between the Siberian air mass and other air masses during the preceding winter. *Subject Headings:* **1. Frontal analysis Long range forecasting 3. Tohoku District, Japan.**—*Author's abstract.*

12N–466 551.515.81:629.12/13:35

Čubrić, Dragutin, **Uticaj i korištenje vremenskih prilika u pomorskim bitkama u toku II Svjetoskog rata na Tihom oceanu.** [Importance and utilization of weather information in the Pacific naval battles of World War II.] *Mornarički Glasnik,* Split, Yugoslavia, No. 3, **1953.** 8 p. 6 figs. Abstracted from reprint. **DWB**—The structure of frontal discontinuities of air masses is explained. As examples of how much frontal discontinuities can be used for the benefit of military action the author describes the operations of the U. S. Navy and Air Force in the attacks on the Marshall and Gilbert Islands, the battle of the Coral Sea, the battle of Midway and the first air raid on Japan. Schematic diagrams showing location of air masses and of combat fronts during these operations are presented. *Subject Headings:* **1. Aeronautical meteorology Frontal structure 3. Military meteorology.**—*G.T.*

12N–467 576.8(265)·551.515.8

Hirasawa, K., **"Yakumizu" (red tide).** *Journal of Meteorological Research,* Tokyo, 5(5):361–367, June **1953.** 8 figs., 4 tables, 11 refs. In Japanese; English summary p. 351.—The phenomenon called "Yakumizu" (red tide) appears near the coast of Sanriku every spring. It is found that "Yakumizu" contains many plankton, about 100 times as numerous as the Oyashio current which is the most nutritious for plankton. It is shown that the red tide forms on Polar fronts through the outbreak of cold water appearing as northerly drifting currents induced by special pressure patterns. "Yakumizu" is classified into two types: one is a cut-off type and the other a frontal type. Diurnal and long range changes are analyzed. *Subject Headings:* **1. Plankton 2. Polar front currents 3. Red tide 4. Japan Sea.**—*Author's abstract.*

12N–468 551.515.8:551.511:551.524.7

Kitaide, M. and Kawamoto, T., **On the existence of subtropical frontal zone.** *Journal of Meteorological Research,* Tokyo, 5(1):47–56, March **1953.** 10 figs., 3 tables. In Japanese; English summary p. 47.—This analysis of the distribution of mean equivalent potential temperature in lower levels reveals a conspicuous frontal zone along the south coast of Japan, which cannot be detected from surface data. The author emphasizes the importance of this frontal zone and calls it the subtropical frontal zone, whose existence and mechanism are made clear by various methods

of analysis, such as lapse rate analysis and air mass analysis. The mechanism of heavy monsoo snow fall in Hokuriku District is discussed in the light of the subtropical frontal zone. *Subje Headings:* **1. Equivalent potential temperature 2. Frontal zones 3. Hokuriku District, Japa** —*Authors' abstract.*

12N–469 551.515.8:551.513

Rodewald, Martin, **Die ITF oder ITC.** [ITF or ITC.] *Wetterlotse,* 63–64:224–227, Nov Dec. **1953.** 3 figs. **DWB**—Definition and descriptions of intertropical front of convergence wi illustrations from SW Pacific and S of C. Verde Islands. *Subject Heading:* **1. Intertropic convergence zone.**—*C.E.P.B.*

12N–470 551.515.8:551.509.3

Sumner, E. J., **The annual and geographical distribution of cold pools.** *Great Britai Meteorological Research Committee, M.R.P.* 837, Oct. 20, **1953.** 4 p. 18 figs., table, 2 ref Mimeo. **GB-MO.**—In continuation of *M.R.P.* 764, frequency of all cold pools with one or mo closed lines in 1000–500 mb charts is tabulated for annual and geographical distribution. Resul are shown graphically and discussed. *Subject Headings:* **1. Cold pools 2. Upper air analysi** —*C.E.P.B.*

12N–471 551.515.83(262

Ermini, Virgilio, **La frontogenesi invernale mediterranea.** [Winter frontogenesis in th Mediterranean.] *Rivista di Meteorologia Aeronautica,* Rome (14(3/4):10–16, July/Dec. 195 4 figs., 9 refs. Italian, French, English and German summaries p. 10.—Based on the analys of the various meteorological and aerological elements, and on long personal experience, the auth suggests that the line or zone of the winter Mediterranan frontogenesis may not be a traditionall accepted one, but should be modified and made to follow, in its western part, a line to the sout instead of north, of the Atlas chain. *Subject Headings:* **1. Frontogenesis 2. Mediterranea Sea.**—*Author's abstract.*

12N–472 551.515.8:551.46(263.4

Franceschini, Guy A., **Modification of air masses over the Gulf of Mexico.** Texas A. M. College. Dept. of Oceanography, Contract AF 19(604)-169, Final Report, Oct. **1954.** 3 **DWB**—An administrative report, outlining research activities and indicating results. It is co cluded that modification of the air masses depends mainly on the water temperature of the Gul A denser observational network is needed. Franceschini presented 4 scientific reports which we published previously under this contract: No. 1, **The distribution of mean monthly wind stre over the Gulf of Mexico.** 19 p. 14 figs., table, refs., eqs. (For abstract, *see* 9F–56, June 195 *Met. Abs.*); No. 2, **Reliability of commercial vessel reports of sea surface temperatures in th Gulf of Mexico.** 9 p. 5 figs., 4 refs. (For abstract, *see* 9E–33, May 1958, *Met. Abs.*); No. **Modifications in tropical air crossing the Gulf of Mexico toward the United States.** 12 9 figs., table, 5 refs. (For abstract, *see* 6.4–169, *Met. Abs.*); No. 4, (with Reynolds, George W. **Auxiliary weather stations in states bordering the Gulf of Mexico.** 28 p. fig. (fold.) Loc tions in the states bordering the Gulf of Mexico at which certain weather data are regular recorded are presented in Report No. 4. These are auxiliary stations whose data are not pu lished by the government weather services and are not available through normal channels. Th elements observed, the frequency of observation, and length of record are tabulated. This repo represents the results of a partial survey of such locations. *Subject Headings:* **1. Air ma modification over sea 2. Gulf of Mexico.**—*A. Assur.*

12N–473 551.515

Mothes, Hans, **Über die Auswirkung von Schlechtwetter-Fronten im Klagenfurter Becke** [Effect of bad weather fronts in the Klagenfurt basin.] *Carinthia II,* Klagenfurt, Beiheft, No. June **1954.** 56 p. 12 figs., 15 tables. **DWB** (M15.8 M918ub)—The purpose of this detail analysis was to gain knowledge in order to facilitate weather forecasts for air navigation. The 2 fronts (plus 14 fronts with precipitation) which passed over the Klagenfurt Basin during Ja 1942–June 1944 are classified into 15 (20) warm fronts, 156 (160) cold fronts and 67 (7 occlusions, discussed and tabulated in terms of annual and day-hour distribution. The synop conditions during passage are given, also, the frontal effect on cloudiness, precipitation and surfa winds is analyzed and discussed. *Subject Headings:* **1. Frontal effects on weather 2. Front frequencies.**—*W.N.*

12N–474 551.515.8:551.555.9(522.

Kasamura, Y., **On the southerly cool air at Ōita.** *Journal of Meteorological Researc* Tokyo, 7(3):188–190, March **1955.** 4 figs., 2 tables, 7 refs. In Japanese. **DWB**—Analysis

optic situation during a temperature drop caused by Polar air returning from the south after easterly movement across the mountains of Japan. Upper air conditions for 5 stations are lyzed in a cross section chart to show structure of cold air up to 4.5 km. *Subject Headings:* **Cold fronts from south 2. Oita, Japan.**—*M.R.*

12N–475 551.515.8:597

Kiss, István, **Az aerob es anaerob légzés vizsgálatának szerepe az időérzékenység kuta-ban.** [Role of the study of aerobic and anaerobic breathing in weather sensitivity research.] *járás, Budapest,* 59(4):218–223, July/Aug. **1955.** fig., table, 4 refs. Russian and German maries p. 218. **DWB, DLC**—Relationships are established between the breathing of fish and ain plant microorganisms and the weather. Oxidizing breathing shows considerable decrease ng prefrontal, and increase during postfrontal situations, while anaerobic breathing, i.e. re-ion processes, increase during prefrontal situations. *Subject Headings:* **1. Frontal effects on athing 2. Weather sensitivity 3. Fish ecology.**—*Transl. from author's abstract.*

12N–476 551.515.8:582.26:631.4

Kiss, István, **A talaj növényi mikroszervezeteinek élet és az időjárás.** [Life of plant roorganisms in the soil and weather.] *Időjárás,* Budapest, 59(6):339–343, Nov./Dec. **1955.** 9 refs. Russian and German summaries p. 339. **DWB, DLC**—In numerous cases a con-ion was observed between the mass propagation of various algae in the soil and prefrontal optic situations. As an example of this relationship, at Pápa, Hungary, in 1948, data on diness, precipitation, wind, frontal passage, temperature and the number of algae are graphi-y compared. *Subject Headings:* **1. Biometeorology 2. Prefrontal effects on soil algae 3. l algae 4. Pápa, Hungary.**—*G.T.*

12N–477 582.2:551.481:551.515.8

Kiss, István, **Meteorobiológiai vizsgálatok a növényi mikroszervezeteken.** [Meteorobio-cal investigations on plant microorganisms.] *Hidrológiai Kőzlöny, Budapest,* 35(9/10):343–Sept./Oct. **1955.** 5 figs., 6 refs. **DWB**—For some 25 yrs the author has been observing s of sudden multiplication of floral microorganisms in shallow pools and has found such cases e connected with prefrontal situations. Traditional popular belief in Hungary supports this ry. Biological and meteorological data on several observed cases are presented, showing ked correlation between activation of aquatic plant life and frontal passages. *Subject Head-:* **1. Microorganisms 2. Pool flora 3. Prefrontal effects on microorganisms 4. Hungary.** *T.*

12N–478 551.515.8

Recent investigations of fronts. *Meteorological Magazine,* London, 84(997):213–218, July 5. fig., 3 refs. **DWB**—Meteorological Office discussion on March 21, 1955, was opened by W. Pothecary. He summarized recent investigations of speed of warm fronts, warm front fall and aircraft investigations of frontal zones. Other recent work, theoretical and observa-al, on frontal structure was brought out in the discussion. *Subject Heading:* **1. Fronts. I. hecary, I. J. W.**—*C.E.P.B.*

12N–479 551.515.83:551.593.1

Baer, Ledolph, **A study of kinematic components in frontogenesis.** Texas. Agricultural Mechanical College. Dept. of Oceanography, Contract AF 19(604)-559, Scientific Report, No. eb. **1956.** p. 17–45. 10 figs., table, 15 refs., 8 eqs. **DWB** (M57.2 T355a)—Horizontal de-nation plays an important part in modifying patterns of temperature, and it therefore should e a significant role in the growth and decay of fronts and major jet streams. The study of role of deformation is handicapped by the difficulties in evaluating and analyzing deformation inely on synoptic charts. The problem might be alleviated by applying known model patterns eformation to the standard pressure charts. This study may be considered a preliminary test he feasibility of this substitute approach. The results show that the model patterns give a onably good measure of the actual deformation, and that for most needs the substitute method ld be the more efficient. *Subject Headings:* **1. Frontogenesis 2. Horizontal deformation** *uthor's abstract.*

12N–480 551.515.83:551.557.5(44/64)

Cazale, H., **Exemple de frontogénèse en France et au Maroc en liaison avec le "jet am."** [Example of frontogenesis in France and Morocco in connection with the jet stream.] *t, Morocco. Institut Scientifique Chérifien. Service de Physique du Globe et de Météoro-, Annales,* 16:139–141, **1956.** fig., 18 refs. **DLC**—Application of H. Riehl's analysis method

to two disturbed situations involving France and Morocco. The first analysis concerns the situ tion that caused inundations in France on Feb. 10, 1955 and the second deals with the disturb situation on Dec. 28, 1952 in Morocco. *Subject Headings:* **1. Frontogenesis 2. Jet strea 3. France 4. Morocco.**—*A.V.*

12N–481 551.515.81:551.55

Gusev, A. M. (*Acad. of Science, U.S.S.R.*), **Nekotorye obshchie voprosy teorii prois hozhdeniia meteorologicheskikh frontov i teorii novorossiiskoĭ bory.** [Some general theoreti questions on the origin of meteorological fronts and the Novorossiisk bora.] *Akademiia Na SSSR, Doklady,* 109(4):757–760, Aug. 1, **1956.** 4 figs., 3 refs., 8 eqs. **DLC**—The fall-wint circulation over the Black Sea coast and over an extended area of the northern sea route, cha acterized by a distinct temperature inversion at 500–1500 m, is interpreted as a monsoon ph nomenon and the Novorossiisk bora is considered the result of wave oscillations originating the surface of separation of the atmospheric monsoon currents. The author discusses the role monsoon circulation in frontogenesis, KOCHIN's analysis of the small oscillation of the surface inclination of the boundary between two air streams of different densities and the application KOCHIN's conclusions to the explanation of the origin and character of the Novorossiisk bo *Subject Headings:* **1. Frontal circulation 2. Bora theory.**—*I.L.D.*

12N–482 551.515.8:551.513.1:551.583.

†Křivský, Ladislav and Gregor, Zdeněk, **Dlouhobodé kolísání atlantickoevropské frontál zony ve vztahu k podnebí.** [Long period variations of the Atlantic-European frontal zone relation to climate.] *Meteorologické Zprávy,* Prague, 9(5/6):144–148, **1956.** 4 figs., 24 re English summary p. 144. **DWB**—Maps of mean frequency of frontal zones in Jan., April, Ju and Oct. were drawn in an earlier paper (*see* 8.1–199, Jan. 1957, *Met. Abs.*) based on data fr the U. S. Weather Bureau's **Daily synopsis series, Historical weather maps, Northern Hem sphere, sea level, Jan. 1899–June 1939** (*see* 5A–105, Jan. 1954, *Met. Abs.*). In this paper maps, based on the same data, are presented for the same months, showing changes in frontal zo distribution which occurred between the period 1900–1919 and the period 1920–1939. After review of literature on large scale circulation changes and climatic variations, the authors conclu that meridional air mass exchange has increased from 1900–1919 to 1920–1939 in winter, spri and summer (N. Atlantic and Europe) and that this increase is accompanied by a rise of me temperature. *Subject Headings:* **1. Frontal zone variations 2. Meridional exchange 3. C matic variations.**—*G.T.*

12N–483 551.515.81:551.509.

§McQueen, H. R. and Martin, R. H. (*National Weather Analysis Center, U. S. W. B., Was ington, D. C.*), **A cool, damp period associated with the spring-like frontal waves over t Eastern United States, July 18–25, 1956.** *Monthly Weather Review,* 84(7):277–289, July 19 7 figs., 15 refs. **DWB, DLC**—A general discussion of the occurrence of well defined Polar fro in the Gulf States during July and the associated temperatures and precipitation in adjoining are is presented. This is followed by a detailed study, on the basis of 0300 GMT surface maps a 0300 GMT upper air charts of the unusually long lived polar front of July 18–25, 1956. T antecedent conditions, the synoptic situation, the persistence of the cold low, the associated te perature distribution, moisture in the upper air, instability, vertical motion, jet streams, tro spheric conditions, the areas of heaviest precipitation and the effects of local storms are discuss *Subject Headings:* **1. Polar fronts 2. Synoptic analysis 3. Cool summer, 1956 4. Easte United States.**—*I.L.D.*

12N–484 551.515.

Ogata, T.; Kanazawa, M. and Yoshida F., **On the particular weather phenomenon b tween warm and cold sea currents,** Pt. 1. *Journal of Meteorological Research,* Tokyo, 8(8 516–522, Oct. **1956.** 15 figs., 5 tables, refs. In Japanese. **DWB, DLC**—The authors inves gated the cause of the unstable air and the second front which accompanied the south side of t Bai-u front. Observational data obtained at a Southern Ocean station, June 29–30, 1953, ha been analyzed and compared with an Earth surface chart covering the same period. The da showed that on June 29 the warm and cold fronts were moving at a speed of 15 km/hr, and th a high pressure ridge formed in the Southern Ocean. A correlation between the Bai-u fr and unstable air, and the second front, was obtained. *Subject Headings:* **1. Frontal passag 2. Air masses 3. Fronts 4. Bai-u 5. Southern Ocean.**—*K.C.*

12N–485 551.515.

Pothecary, I. J. W., **Recent research on fronts.** *Weather,* London, 11(5):147–150, M **1956.** 4 figs., 2 refs. **DWB**—Account of modifications of Bjerknes' "classical" warm front

Meteorological Research Flight, flying from Farnborough. Cross sections show temperature depression of frost point in warm front of Nov. 29, 1954. A front almost always has a ue of very dry air extending downwards. The trajectory of the dry air on Nov. 28–29 is vn. *Subject Heading:* **1. Frontal structure.**—*C.E.P.B.*

12N–486 551.515.8:551.577.51(234.42)

Romov, A. I., **O vliianii Karpat na osadki, vypadaiushchie nad territoriei Ukrainy.** ect of the Carpathian Mountains on precipitation in the Ukraine.] *Kiev, Ukraine. Ukrainskii chno-Issledovatel'skii Institut, Trudy,* No. 5:118–125, **1956.** 5 figs., 12 refs., eqs. **DWB,** C—Some peculiarities of the influence of the Carpathian Mountains on precipitation distribution ng the passage of cold and warm fronts over the Ukraine are discussed on the basis of synoptic absolute topography. Charts are presented and discussed. *Subject Headings:* **1. Orographic fall 2. Carpathian mountains.**—*A.M.P.*

12N–487 551.515.8:551.576.4

Selezneva, E. S., **O vysote nizhneĭ granitsy vnutrimassovykh sloistykh oblakov.** [The ht of the base of (intra) air mass stratus clouds.] *Leningrad. Glavnaia Geofizicheskaia ervatoriia, Trudy,* 63(125):22–31, **1956.** 6 figs., 8 refs., eqs. **DLC**—This article represents analytical investigation of low level cloudiness and the atmospheric conditions causing it. mer hypotheses are considered and gradual changes in them are described. Several attempts orrelate the theoretical and empirical conclusions are described. The work of some previous stigators is discussed. A number of numerical examples and their comparisons are given. cases of watery and crystalline types of clouds are considered. The author, on the basis of logical data, states that certain formulas, previously used, are not suitable for the computation he cloud heights and indicates others that are more useful. *Subject Headings:* **1. Cloud base top heights 2. Stratus clouds.**—*B.J.G.*

12N–488 551.515.8(94)

Troup, A. J. (*Div. of Meteorological Physics, C.S.I.R.O., Melbourne*), **An aerological study he "Meridional Front" in Western Australia.** *Australian Meteorological Magazine,* Mel- rne, No. 14:1–22, Sept. **1956.** 2 figs., 3 tables, 16 refs. **DWB**—Examination of simultaneous o soundings at Perth and Kalgoorlie, when a "meridional front" lies between the stations, vs that half the disturbances are nonfrontal in nature. A subdivision of "frontal" and "non- ital" cases is made, and some considerations on the structure of each type are advanced. A ly of the associated weather and upper wind observations, and of the synoptic situation, also vs some important differences between the types, although it is difficult to distinguish between n on surface weather observations alone. *Subject Headings:* **1. Meridional fronts 2. Synop- situations 3. Upper air wind observations 4. Western Australia.**—*Author's abstract.*

12N–489 551.515.8:551.576.3

Ura, T., **The distribution of medium and lower cloud layers near the surface of discon- ity.** *Journal of Meteorological Research,* Tokyo, 8(1):43–45, March **1956.** 7 figs., 3 refs. Japanese. **DWB, DLC**—Study of distances between medium and lower cloud layers (As and , for vertical cloud distribution chart, is made by actual air-borne observations between Tokyo Fukuoka route. Adjoining horizontal distance between medium and lower cloud layers ranges n 60–90 km. Horizontal distance between the discontinuity line and flight route, slopes of discontinuity line and relations with vertical air current and geographical conditions are dis- ed. *Subpect Headings:* **1. Cloud distribution near fronts 2. Vertical cloud distribution rts 3. Cloud observation from airplanes 4. Frontal cloud structure 5. Japan.**—*J. Woo.*

12N–490 551.515.8:551.555.6(497.2)

Blagoev, Khr. and Lalovski, Khr., **Kontinentalni nakhluvaniia nad Bulgariia prez esenta.** ntinental air invasions over Bulgaria in the autumn.] *Khidrologiia i Meteorologiia,* Sofia, 1: 2, **1957.** 2 figs., 4 tables. Russian and English summaries p. 41–42.—The Polar and Arctic inental air invasions are shown to come from the NW, N, NE, E or SE along 4 major axes. and spring are much alike in this respect. Characteristics of outbreaks depend on source on as well as season. Frequency of each type (1946–55) in the autumn and spring is tabulated discussed, and the weather in Bulgaria accompanying each type analyzed. Illustrative synoptic ts are presented for the extreme Arctic type. *Subject Headings:* **1. Cold air invasions 2. l-waves 3. Bulgaria.**—*M.R.*

12N–491 551.515.8:551.509.53

Hughes, Lawrence A. (*U. S. W. B., Chicago*) and Saxton, David W. (*U. S. Air Force*), **lication of long-wave principles to a cold outbreak.** *American Meteorological Society,*

Bulletin, 38(6):329–334, June **1957**. 6 figs., 9 refs. **DWB, DLC**—An incipient severe Pola outbreak (Nov. 9–12, 1955) that eventually affected practically all of the U. S. was considerabl delayed by retrogression of a major trough in the westerlies. An investigation of this retrogressio shows how long wave principles aid in the prediction of such outbreaks. *Subject Headings:* **Cold air outbreaks 2. Cold wave forecasting 3. Waves in the westerlies.**—*Authors' abstrac*

12N–492 551.515.83:551.511.

Gubin, V. I., **O sviazi frontogeneza s izmeneniem vikhria.** [Relation of frontogenesis t vorticity variations.] *Akademiia Nauk USSR, Izvestiia, Ser. Fiziko-Matematich. Nauk*, No. 4 39–54, **1957**. 10 refs., 35 eqs. **DLC**—The variation of horizontal vorticity with time involves th transformation of energy in the atmosphere. The external manifestation of these transformation is the evolution of a solenoidal field, in particular a vortical solenoidal field. But with the latte are associated processes of frontogenesis with the most intensive energy transformations. Th relationships between changes in horizontal vorticity and frontogenesis in frontal zones are analyze in this study. The solution of the problem of the structure and change of an extended vortex obtained by means of conservation theorems. Variations of the theorem of conservation can b obtained from ERTEL's socalled theorem of conservation which is shown to be a consequence o FRIDMAN's equations for vorticity. From the vortex equation of Ertel for a rotating Earth, a equation of conservation for a baroclinic atmosphere is derived, which is considered the funda mental equation of hydrodynamics and thermodynamics. Proceeding from this equation the autho presents a mathematical analysis of frontogenesis, the relationship between frontogenesis and vo tices, and of cyclogenesis and anticyclogenesis. *Subject Headings:* **1. Frontogenesis-vorticit relationships 2. Ertel's vorticity theorem.**—*I.L.D.*

12N–493 551.515.8:"32

Jilek, Josef, **Roční období.** [Seasons of the year.] *Meteorologické Zprávy*, Prague, 10(3 65–68; **1957**. 6 figs., ref. Russian summary p. 65. **DWB**—For Central Europe the year can b divided into 5 seasons according to the position of air mass centers. Fall begins with the forma tion of a Siberian center, prewinter with a Canadian center, winter with a center over the Whi Sea, spring with the dissipation of this latter, and summer with the formation of a center of co tinental air over the European U.S.S.R. *Subject Headings:* **1. Seasons 2. Air mass locatio 3. Central Europe.**—*Transl. of author's abstract.*

12N–494 551.515.8(439.1

Ozorai, Zoltán, **Az időjárási frontek és a légtomegek mai szemmel.** [Present views o fronts and air masses.] *Időjárás*, Budapest, 61(6):429–435, Nov./Dec. **1957**. 7 refs. Englis summary p. 429. **Comments** by Z. Berkes, *Ibid.*, 62(1):48–50, Jan./Feb. **1958. DLC**—Th author criticizes some of the procedures used for the last 20 yrs in preparing frontal and air mas calendars for Budapest, and quotes several examples of obvious discrepancies in the publishe calendars. Most of the mistakes, in the author's opinion, are due to a formalistic concept of th properties of fronts and air masses, neglecting their three dimensional characteristics. BERKE essentially agrees with OZORAI but dissents with his criticism in several details. *Subject Heading* **1. Air mass analysis 2. Frontal analysis 3. Budapest, Hungary.**—*G.T.*

12N–495 551.515

*Williams, Dansy T., (*U. S. W. B., Kansas City, Mo.*), **A method for computing divergen along a wind shift line.** Issued Aug. 22 (rev. Sept. 16), **1957**. 10 p. 8 figs., 4 refs. Repr duction of typescript. **DWB** (M15.8 U587me)—A method is presented by which single stati surface wind data and the direction and speed of movement of a wind shift line can be used compute the divergence along the wind shift line at the time it passes the station. The method compared with the direct method, using data from a micronetwork of surface stations. *Subje Headings:* **1. Divergence computation techniques 2. Wind shift line.**—*Author's abstract.*

12N–496 551.515

§Zubian, G. D., **Nekotorye voprosy prostranstvennogo termobaricheskogo stroeniia atm fernykh frontov.** [Some problems of the 3-dimensional thermobaric structure of atmosphe fronts.] *Meteorologiia i Gidrologiia, Leningrad*, No. 8:48–54, **1957**. fig., 5 refs., eqs. **DL DWB**. Transl. into English available for reference, **DWB** (M15.8 Z93so)—A reply to the u favorable criticism made by M. P. LEONOV (*Met. i Gidro.* No. 4, 1957) of the author's **Sinoptik aerologicheskoe issledovanie atmosfernykh frontov** [Synoptic aerological investigation atmospheric fronts]. Leningrad. Gidrometeoizdat., **1955**. ZUBIAN maintains that his conc sions concerning the penetration of frontal zones into the upper layers correspond to reality sin the large horizontal temperature differences obtained by him characterize frontal zones in t

er atmosphere. Various other criticisms are answered in detail, and the correctness of some dmitted. (For original paper, *see* 8.10-26, Oct. 1957, *M.W.*) *Subject Headings:* **1. Frontal lysis 2. Synoptic aerological studies. I. Leonov, M. P.**—*I.L.D.*

12N–497 551.515.8:551.509.318:551.510.528:551.513

Galloway, James L. (*Met. Service of Canada*), **The three-front model, the tropopause and jet stream.** *Weather*, London, 13(12):395–403, Dec. **1958.** 8 figs., 15 refs. **Comment** by A. Howkins, with title: **Vertical movements near the jet stream.** *Ibid.*, 14(7):237, July 9. 2 figs. Includes **Reply** by J. L. Galloway. **DWB**—Notes on the use of the Canadian ee-front model (*see* 10.3–237, March 1959, *Met. Abs.*) to interpret and study the jet stream-opause structure in the 3 frontal zones (Arctic, Maritime and Polar) separating the 4 air sses. Each air mass has a characteristic tropopause and each frontal area a characteristic jet am. Sample frontal contour charts, 300 mb charts, tephigrams for different places and air sses and circulation models illustrate this structure. *Subject Headings:* **1. Three-front models Tropopause-jet stream relationships 3. Tephigrams 4. Canada 5. Northern United tes.**—*M.R.*

12N–498 551.515.8:551.511:551.558(522)

Imakado, M., **Analytical study on the activity of Bai-u front over Kyūshū, 1955.** *Journal Meteorological Research*, Tokyo, 10(7):545–548, July **1958.** 7 figs., 5 refs., 3 eqs. In Japa-e; English summary p. 545. Also: [**Comments** by] T. Asakura, and [**Reply** by] Imakado, *l.*, 10(11):976–977, Nov. 1958. In Japanese. **DLC**—The author computed the divergence vertical current along the Bai-u front in Kyushu for the period May 20–July 10, 1955. Prin-al results are as follows: (1) Main divergence layer was found at the upper and middle tropo-ere and main convergence layer at the friction layer. (2) Nondivergence levels were found bout 400 and 850 mb. (3) Positive relative divergence (500–850 mb) tends to stimulate heavy nfall. (4) 1–2 days after the occurrence of downward motion in the whole troposphere over ushu, heavy rainfall occurs. *Subject Headings:* **1. Bai-u 2. Air mass movement 3. vergence computations 4. Kyushu, Japan.**—*Author's abstract.*

12N–499 551.515.8:551.524.36(624)

Lebon, J. H. G., **An exceptionally cool season in North-Eastern Africa.** *Weather*, London, 5):153–157, May **1958.** 3 figs. **DWB**—The atmospheric circulation and the air masses re-nsible for the cool weather in northern Sudan (mid-Dec. to mid-Feb.) are described briefly and circulation conditions responsible for the unusual persistent subnormal temperatures that pre-led during Jan.–March 1957 are discussed in detail. An unusually strong outflow of air from Russian winter anticyclone across the Black Sea and the eastern Mediterranean occurred. ring the last week of Jan. and first week of Feb. a river of waves traveled along the Mediter-ean Polar Front eastward to Iraq and Iran and each drew a tongue of cold air deep into Africa. mperatures at Khartoum fell 7°–10°C below the average, both by night and day. Resonance as il as regeneration apparently contributed to the unusual spell of cool weather. This wave pro-ed low temperatures as far as the Belgian Congo. But at the end of Feb. there was a pre-ture incursion of monsoon air into the Sudan from the southwest. The possibility of a urgence or caustic oscillation is discussed. *Subject Headings:* **1. Cold air masses 2. Cold movements 3. Subnormal temperatures 4. Northeastern Africa.**—*I.L.D.*

12N–500 551.515.8:551.588.2(529)

Ling, C. C., **A short discussion on the cold fronts influenced by the Taiwan topography.** *teorological Bulletin*, Taipei, Formosa, 4(2):20–23, June 1958. 13 figs. In Chinese; English mmary p. 20. **DLC**—The mountain range, Chung-Yang Shan-mo, is oriented approximately S. The central ridge of this mountain range extends to an average height of 9000 ft. The ography of Taiwan has a marked effect upon the weather of the island. This paper presents noptic research on the subject and describes the movement of air flux over the island and the es of cold fronts occurring there. *Subject Headings:* **1. Topographic influences on cold nts 2. Cold fronts 3. Formosa.**—*Author's abstract.*

12N–501 551.515.8 551.513.2:551.557.5(71)

McIntyre, D. P. (*Met. Services of Canada*), **The Canadian 3-front, 3-jet stream, model.** *ophysica, Helsinki* 6(3/4):309–324, **1958.** 10 figs., 14 refs. **DWB, DLC**—Over the past few rs Canadian meteorologists have been developing and using operationally an analysis model ed on three major frontal systems. This model has led to greatly improved, and more con-tent, synoptic analyses. The front—jet stream relationship first described by PALMÉN is found apply to all three fronts. At tropopause level, above each of the three frontal systems is a

jet stream system. The structure of this front—air mass—jet stream system is described in deta and illustrated with examples. *Subject Headings:* **1. Frontal models 2. Jet stream mode 3. Canada.**—*Author's abstract.*

12N–502 551.515.8(5

Mohri, Keitaro (*Japan Met. Agency, Tokyo*), **An example of upper frontogenesis over th Far East.** *Journal of Meteorological Research,* Tokyo, 10(7):539–544, July **1958.** 7 figs., 4 ref eq. In Japanese; English summary p. 539. **DLC.** Also issued in: *Geophysica,* Helsink 6(3/4):325–333, **1958.** 7 figs., 5 refs. **DWB, DLC**—A typical example of upper frontogenes is shown by a series of 300 mb charts and vertical cross sections. It is pointed out that th northward outflow of the tropical air is important for the formation of the subtropical upper fro and the subtropical jet stream over the Far East. *Subject Headings:* **1. Frontogenesis 2. Upp air fronts 3. Far East.**—*Author's abstract.*

12N–503 551.515.8(213

Roth, Harold S. (*U. S. Navy Airborne Early Warning Squadron Four*); Rabenhorst, Davi W. and Stansbury, Thomas A. (*both, Applied Physics Lab.*), **Intertropical convergence zon meteorology.** Johns Hopkins Univ. Applied Physics Laboratory. Contract NOrd 7386, Burea of Ordnance, Dept. of the Navy, (Report) TG-301, Jan. **1958.** 23 p. 9 figs., table, 5 ref **DWB** (M15.8 J35in)—Aircraft reconnaissance of the ITC off the Pacific coast of Central Americ was carried out Sept. 28–Oct. 14, 1957, to obtain by radar the three dimensional patterns on clou formations and rain intensity in thunderstorms over wide areas. Surface and upper air observa tions were obtained by the USS "Norton Sound." Northward surges, which dissipate and reform move northward and again dissipate in the Caribbean, are illustrated. Cloud formations are quit varied, depending on the degree of activity of the ITC. Convective activity may be one of thre types: 1) continuous, 2) midday and 3) nighttime. Characteristic conditions, sounding, tempera ture conditions, and lapse rates, are discussed. Lifting and low level heating are needed to trigge thunderstorm activity. *Subject Headings:* **1. Intertropical convergence zone activity 2. Pacifi coast of Central America.**—*M.R.*

12N–504 551.515.8(4–191

Věková, Nina, **Podmínky při zvlnění front ve Střední Evropě.** [Conditions of frontal wav formation over Central Europe.] *Meteorologické Zprávy,* Prague, 11(2):47–50, **1958.** 14 figs ref. **DLC**—The occurrence of two types of frontal wave formation over Central Europe, e.g (a) passage of a trough from Western to Central Europe and (b) transformation of a wester cyclone situation into a trough over Central Europe, is investigated for the period Sept. 1955–Aug 1956. Ten such cases occurred (their average duration was 3 days) and a surface map is pre sented for each of them. Climatological conditions (temperature, sunshine and precipitatio anomalies) occurring during the two types of frontal wave formation are discussed and maps ar drawn for precipitation anomaly and the number of rainy days corresponding to each type. *Sub ject Headings:* **1. Frontal wave formation 2. Synoptic climatology of frontal waves. 3. Cen tral Europe.**—*G.T.*

12N–505 551.515.8:551.553.8(522

Kohara, N., **Surface analysis of instability line in Kyushu District. Dec. 12–13, 195** *Journal of Meteorological Research,* Tokyo, 11(9):752–761, **1959.** 28 figs., 3 refs. In Japanese English summary p. 752. **DWB, DLC**—Strong gust storms of both warm and cold types wer observed in Kyushu District, Dec. 12–13, 1957, when a low, developing rapidly, moved to th Sea of Japan through South Korea. The following results were obtained on the instability lin formed suddenly in the warm sector of the low: (1) Trough of this low, thunderstorm high, an wake low were detected and traced synoptically. (2) Temperature drop was also detected an traced synoptically and other local characteristics of temperature distribution were obtained. (3 Three types of rain, namely: strong showers accompanied by instability line; rains caused b convergence; and those caused by overrunning of warm air over cold air, were obtained. (4) was supposed that the cause of the thunderstorm high was due to a strong rain shower. *Subjec Headings:* **1. Instability line 2. Strong wind analysis 3. Frontal storms 4. Kyushu Di trict, Japan.**—*Author's abstract.*

12N–506 551.515.

Olberg, Manfred (*Berlin*), **Das Verhalten der Krümmungsradien der Äquipotenialfläche und derjenigen ihrer orthogonalen Trajektorien an Diskontinuitätsflächen der Dichte.** [Th behavior of curvature radii of an equipotential surface on those of their orthogonal trajectories discontinuity surface of density.] *Beiträge zur Geophysik,* Leipzig, 68(5):263–267, **1959.** 8 refs

eqs. German and English summaries p. 263. **DWB**—The proportions of the curvatures of e equipotential surface of geopotential are unsteady on a discontinuity of density. A general rmula is developed giving all these unsteady changes of the curvatures. *Subject Headings:* **Discontinuity surfaces 2. Equipotential surfaces 3. Density discontinuities.**—*Author's stract.*

12N–507 551.515.8:551.513.1(719) or 551.515.8:551.524.36(719)

Rodewald, Martin, **Frost-Stürme unter Neufundland—Labrador im Februar 1959.** [Freez- g storms off Newfoundland, Labrador in Feb. 1959.] *Wetterlotse, Hamburg,* No. 143:41–52, arch 1959. 6 figs. **DWB**—The explanation of the exposure to freezes of the Canadian east ast, more than the coasts of Greenland, is explained on the basis of the constancy of the global mass and of the influence of the sea surface temperatures, affected by the distribution of rometric pressures. Charts and diagrams illustrate the warming paths of the atmosphere during ld air outbursts in Canada; the development of the hurricane of Feb. 8, 1959; overlapping of lder and warmer air around a slowly wandering depression; distribution of the atmospheric mperature in the depression over the Labrador Sea, Feb. 8, 1959; strong temperature differences st of South Labrador during different air paths; and cooling of the low layer outflow due to the eration of the air path. A table shows the temperature oscillations as observed by a German hing boat at its fishing grounds off South Labrador on Feb. 1–2, 1959. *Subject Headings:* **Air masses 2. Freezing temperatures 3. Newfoundland 4. Labrador.**—*O.T.*

12N–508 551.515.83(213)

Ballif, J. R.; Palmer, C. E.; Sinclair, P. C. and Viezee, W., **An empirical study of air ovement near the equator.** California. Univ. Inst. of Geophysics, Contract AF 19(604)-2134, nal Report, Aug. **1958.** 64 p. figs., tables, refs., 15 eqs.—The report is concerned with the lation of inertial and frictional forces, acting on atmospheric parcels moving near the equator, pressure gradient and Coriolis forces. When mean winds, averaged over a period of approx- ately one month, were studied over the Marshall Islands, it was found that quasigeostrophic nditions held, even down to 3°N. The report tabulates, for June 1956, the orders of magnitude the terms in the meteorological equations of motion from the surface to 60,000 ft. It was not ssible to evaluate the pressure gradient term above 10,000 ft, owing to radiosonde errors. A udy was made of "synoptic" wind profiles at individual stations in the belt 5°N–5°S. These ofiles are of a type that appears to be new in tropical meteorology, though similar profiles have en observed in wind tunnels containing blowing sand. An explanation was attempted in terms the effect cumulus clouds might have on the vertical exchange of momentum. If this explana- n holds, the planetary boundary layer near the equator can be considered to extend only to the oud bases. As byproducts of the investigation, some new results on the mean vertical velocities ar the equator were obtained. The results seem to confirm the existence of a Hadley circulation er the Marshalls. Another byproduct of the work is the discovery that long period (greater an 1 yr) changes in the stratospheric zonal wind occur over the equator. *Subject Headings:* **Air mass movements near equator 2. Equatorial circulation 3. Stratospheric winds near uator.**—*Authors' abstract.*

12N–509 551.515.81/3(99)

Ivanov, Iu. A., **Polozhenie i sezonnaia izmenchivost' frontal'nykh zon v Antarktike.** osition and seasonal variation of frontal zones in Antarctica.] *Akademiia Nauk SSSR, oklady,* 129(4):777–780, **1959.** 2 figs., table, 6 refs., 8 eqs. **DLC**—The frontal zone in the ean can be considered as a region with maximum vertical velocities directed to the surface of e sea (zones of divergence) and from the surface of the sea (zones of convergence). Proceeding om the equations of motion in order to study the vertical velocity of flow in the ocean, the author ives an expression which determines the dependence of the vertical velocity of flow at the ction depth (where it reaches a maximum) on the tangential stress of the wind at the surface the sea. The study of the rules of distribution of the maximum values of vertical currents at frictional depth is identical to the study of the position of frontal zones. The results of com- tations shows that frontal zones can be distinguished within the confines of the Antarctic water g (70°–40° South lat.): Antarctic divergence, Antarctic convergence, subAntarctic divergence d subAntarctic convergence. These frontal zones occupy a most northerly position in the spring d an extreme southerly position in the fall, while the mean amplitude of these displacements ounts to 4° lat. *Subject Headings:* **1. Frontal zones 2. Antarctica.**—*I.L.D.*

12N–510 551.515.83(261)

Koppány, Gyorgy, **A lehülési gócok mozgása az atlanti-europai térségben.** [Movement of d centers in the Atlantic-European area.] *Időjárás,* Budapest, 63(2):108–110, March/April,

1959. 2 figs. **DLC**—The importance of isallohypsic maps, visualizing the entire 24-hr tempera ture changes in the lower troposphere, is emphasized for weather forecasts, especially for thos exceeding 36 hrs. The examination of cold weather centers reveals that they originate in highe latitudes or in exceedingly cold continents in winter, as in North America, Greenland, Nort Siberia and eastern Europe. Europe's cold waves are determined primarily by the dominan i.e., the western air current. The more energetic cold waves extend to 8–10 km altitudes ver often; such cases cause an important rise in temperature in the strata above 10 km. It seeme suitable to estimate the speed of the centers of the RT isallohypse of 500/1000 mb by the mea currents of the 700 and 500 mb strata, respectively, because the strongest advective temperatur changes occur in the 3–5 strata of the lower troposphere. It is ascertained that the current o cold centers can be followed and preindicated by current circumstances of 700–850 mb air strata generally. The estimation of mean speed helps to deduce the magnitude of a 24-hr movement The origin of cold waves is useful in estimating the degree of transformation in the lower strata *Subject Headings:* **1. Air mass movements 2. Europe.**—*O.T.*

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